ECONOMIC EVALUATION OF VARIOUS FORESTRY SCHEMES : CASE STUDIES FROM ORISSA

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by

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to the

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

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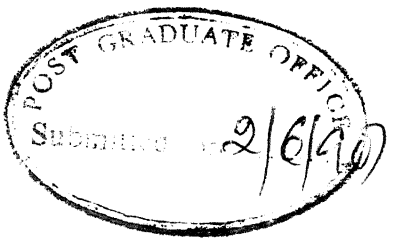
MAY, 1998

CERTIFICATE



This is to certify that the thesis **"Economic Evaluation of Various Forestry Schemes: Case Studies From Orissa"**, submitted by **Ms. Sabita Kumari Acharya** in partial fulfilment of the **Doctor of Philosophy** to the Department of Humanities and Social Sciences, Indian Institute of Technology, Kanpur, is a record of bona fide research work carried out by her, under my supervision and guidance. The results embodied in the thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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Sabita

SYNOPSIS

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Studies on environmental conservation/protection to ensure better quality of life are the urgency and imperative of the modern World entering into 21st century. The environmental subjects, e.g., the global climatic changes, green house effect with carbon-di-oxide increase in the atmosphere, loss of biological diversity or extinction of animal and plant species, critical conditions of tropical rain forests, etc. are the major problems which are often highlighted in various international forums, academic discussions/debates, and also in the mass media. It is realised that most of these problems are inherited from the loss of forest area due to large scale deforestations. Hence, the preservation and regeneration of forests are being stressed as it plays a lead role in the environmental conservation. In addition to these, it is recognised that forest as a form of renewable natural resource has remarkable contribution in the development of an economy. Simultaneously, it is argued that the role of forest is complex- at one end, it is a source of revenue and hence exploitation is natural; at the other end it is needed for environmental conservation and hence should be properly maintained. Besides with rise in population, industrialisation, and infrastructure development which resulted in depletion of forest resources, the situation has been largely changed. A new awareness has been generated through out the World and a great debate is generated about *sustainable forest*

management. In order to meet such challenges, the Governments have undertaken different schemes of reforestation/afforestation.

This study is a modest attempt to understand the role of forests in the development of an economy, particularly, for a developing economy like India. After independence, the Government of India had has been undertaking great care for protecting the environment in terms of plans, programmes and policies. Many policies and programmes are introduced under the Five-year Plans under various National Forest Policies, and Conservation Acts etc. However, the problems are always associated at the implementation level.

In order to solve the problems of forest development, it is argued that to draw proper policies and efficient schemes/programme, there should be projectisation of forest development programmes. This argument is based on the premise that in a planned economy like India, where the investment allocations are by and large predetermined at the national level, these is an urgent need to utilise the scarce resources in such a fashion that the targets set in the national plans are fully achieved. Once the overall plan allocation is made, the problem to be tackled is how to maximise the net benefits from investment, which in turn envisages the problem of ranking the alternative projects. Hence, here lies the importance of the social benefit-cost analysis(SBCA) in a planned economy. The literature on forestry management also portrays the need of SBCA in the forestry sector for establishing their viability. In view of these arguments, in this study we have attempted to evaluate few plantation schemes from a selected region, viz., Orissa. We have selected Orissa as the study area owing to its agrarian characters where forests play a great role for its all-round development.

In this case-study approach by adopting a multi-stage sampling, we have selected eight plantation projects of different categories, namely, Social Forestry, Block Plantations, Cashew Plantations, and Industrial Plantations. The selected are; Gopalpur Social Forestry Project(SFP), and Mundal SFP under the Directorate of Social Forestry Project of Government of Orissa(GoO); Balukhanda C-11 and C-13 under the Territorial

Division of Forest Department of GoO; Ranpur and Kadamjhola 3 cashew projects under the Orissa State Cashew Development Corporation, and the plantation projects of the Ballarpur Industries Limited and the National Aluminium Company Limited. The projects are selected from different agencies with a view to compare their viability so that in planning and policy formulation the most viable agency should be given preference in allotment of land and fund allocations for plantations.

In accomplishing such exercises, we have adopted the approach suggested by the UNIDO Guidelines for project evaluation. Adhering to the above approach we have estimated the benefits and costs of the project in the common numeraire of aggregate consumption. However, with respect to the quantification of the indirect benefits we have, at least, moved one step ahead of the Guidelines. While the authors of the Guidelines are somewhat pessimistic about the estimation of indirect benefits, here in this study, we have been able to quantify some of the indirect benefits of the plantation project, which have been flowing to the economy in the form of externalities.

In addition to these improvements, following the approach advocated in the Guidelines in respect of the calculation of net benefits, we have introduced the shadow prices of inputs and outputs of the project. Some of the relevant shadow prices have been either estimated or approximated by us with the help of some pre-determined national estimated or from other studies.

The data used in this study have been collected from various sources during our field trips to the project sites and to the concerned organisations. In addition to considerable useful information available from the project authorities, we have collected data from both secondary and primary sources. The secondary sources of data have been the relevant Government files maintained in different offices. For some other data like local prices of different products, willingness-to-pay, amount of fuel collection and fodder supply we have undertaken a primary survey in the adjoining villages of the projects. The

method of primary data collection has been a rough and ready random sampling method via direct contact and open enquiry.

With the help of the primary and secondary data we have estimated the annual benefits and costs of the project starting from the period of commencement of the construction works to the termination of their life-spans. Further, in quantifying the benefits and costs in monetary terms we have used the 1990-91 prices as the standard base year prices. When the figures available to us are in terms of different year price levels, we have inflated/deflated with the wholesale price indices to the base year level.

In tune with the first step of SBCA we have analysed the financial profitability of the projects at market prices. In order to account for inter-temporal variations we have discounted the net financial benefit flows with different rates of discount. Since low rates of discount are being advocated for forestry projects, we have discounted the projects in the range of 2%-12% rates of discount.

In view of the imperfections in the market prices of inputs and outputs, and to take care of those market distortions, in the second step, we have evaluated the projects in terms of shadow/economic prices instead of market prices of inputs and outputs like labour, land, fertiliser and timber. With help of those shadow prices and weights, the economic analysis has been undertaken in terms of the evaluation criteria like NPV, BCR, and IRR with the economic discount rate of 11%.

In the third step of SBCA, we have incorporated the externalities/indirect benefits in the form of fuel and fodder supply following the Contingent Valuation Method. In the next step, the environmental/ecological benefits are estimated on the basis of various studies and added to the benefit stream. With the social rate of discount of 2%, as has been argued in the literature, we have estimated the decision-making criteria of NPV, BCR and IRR. Since our sample projects vary widely with respect to the plantation area and in terms of capital investment, we realised that the conventional DCF criteria are not

sufficient for intra-project comparisons. Hence, another criterion i.e. NPV per hectare is being introduced in to our analysis to draw the final policy implications.

Our results have established that social forestry project with mixed species is the most viable project followed by industrial plantations to augment raw materials. On the basis of our field observations and results we have finally drawn upon few policy implications for the planners/policy-makers.

The main contribution of the thesis lies in its application of SBCA to forestry sector which has been the need of the day. More particularly, the contribution lies in its attempt of comparing different schemes as well as estimating the indirect benefits, including ecological benefits.

Dedicated to My MAA

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ABBREVIATIONS

BCR	Benefit-Cost Analysis
BILT	Ballarpur Industries Limited
EDR	Economic Discount Rate
Ha	Hectare
IRR	Internal Rate of Return
Mha	Million Hectare
NALCO	National Aluminium Company
NCA	National Commission on Agriculture
NPV	Net Present Value
NWDB	National Wasteland Development Board
OECD	Organisation for Economic Co-operation & Development
SBCA	Social Benefit-Cost Analysis
SDR	Social Discount Rate
SFP	Social Forestry Projects
SWR	Shadow Wage Rate
UNIDO	United Nations Industrial Development Organisation
VWL	Village Wood Lot

Chapter 1

INTRODUCTION

1.0 Importance of Forests

In recent years, a growing awareness about the environmental conservation/ protection to ensure a better quality of life has focused on the special role that environment can play in the economic development of a country. Further today's economic view of environment that it is a kind of mutual asset for non-reproducible capital good that produces the stream of economically valuable direct and indirect goods and services for man(in the form of tangible, intangible and functional) has convincingly shown that there can be no rational and equitable economic development without environmental conservation. Hence, conservation and economic development should ideally be directed towards a common goal i.e. the rational use of earth's resources to achieve the highest quality of living for mankind. The existence or the absence of favourable natural resources can facilitate or retard the process of economic development. In this context W.A. Lewis writes: "The extent of a country's resources is quite obviously a limit on the amount and type of development which it can undergo."[1]

With a view to integrate environment to economic development, the World Bank has highlighted the environmental issues and problems of the World and have suggested a number of remedial measures for the developed as well as developing countries. It has further identified that one of the causes of environmental problems has been large scale deforestation and degradation of land and water. Moreover, when the focus of development has changed from higher growth to sustainable development, the international agencies as well as policy makers have laid stress on conservation and regeneration of the natural resources like forest.

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[1] Lewis, W.A.(1955), "The Theory of Economic Growth", Allen and Unwin, p.52.

Forest resources had have always played a key role in promoting an era of economic development of a country by way of maintaining the natural ecological balances and preserving our natural environment. As expressed by Kneese[2] environment is of considerable value to man as a source of material inputs for production and consumption.

It is argued in the literature that the environment has a capacity to accept, absorb, and assimilate most of the types of returning materials. But when this absorptive and assimilative capacity is over used or misused, pollution and environmental degradation is the result. Since this absorptive and assimilative capacity is controlled by the degree of forest cover, it is stressed that the trees should be maintained at certain level. In order to maintain such a balance, it has been estimated that one- third of the total area of India should be under forest cover whereas in reality it is a long way to reach near the target. Furthermore, forests also contribute to attain the planned goals of income and employment generation, as well as backward area development. Moreover, they provide fuel for our sustenance, supply raw materials for our industries, and provide sanctuaries for the wild lives. In view of these primacy of forest, in any rational land use plan the forest resources had have a special significance.

1.1 Scope of Social Forestry

In the past, owing to abundance of forest resources, the subject forestry seldom drew attention from the general public. In those days, forest resources management, by and large, was of interest to foresters alone. However, with rise in population, industrialisation, and infrastructure development which resulted in depletion of forest resources, the situation has been largely changed. A new awareness has been generated through out the World and a great debate is generated about 'sustainable forest management'. While the initial emphasis of sustained yield was on output maximisation(maximum sustained yield), it has gradually shifted to value maximisation(maximum economic yield) and recently it has been replaced by the concept of socially optimum yields(optimum sustained yield). Forest laws, foresters and

[2] Kneese, Allen V.(1995), "Natural Resource Economics", Edward Elgar Publication Co., UK.

academicians have defined sustained yield differently to suit the economic conditions of particular societies and forests of particular regions. After a review of the available definitions, Wiebecke and Peters have defined forest sustenation as 'the endeavour to facilitate the continuous and optimal provision of all tangible and intangible effects of the forests for the benefit of present and future generation'[3]. Hence to attain sustainability in forest resources. almost every country has launched nation wide programmes with focus on two policy directions:

- protection of remaining natural forests; and
- rehabilitation of degraded forest land by promotion of reforestation programs.

At the same time, however, many forestry experts have discussed the seriousness of deforestation of the tropical forests and their consequences and have started arguing that promotion of forestry schemes could reduce the rural poverty problems as well as and the social and economic constraints of land less or marginal farmers. They have insisted that without tackling these root causes, no forestry development programmes could be successful. Hence, they have advocated the importance of integrated forest management with large scale people's participation. The essential point of this recognition was that long term benefits to rural communities can be derived from people's participation in the forest management schemes, because the tropical forests provide not only materials for forest based industries, but also are the life supporting system for the rural population by offering:

(a) food and energy;

(b) various non-wood forest products such as gum, resin, nuts and medicinal plants;

(c) fertile soils and clean water; and

(d) environmental protection as a shelter for all life forms.

This common understanding to this effect was already reflected partly in the Seventh World Forestry Congress in Buenos Aires, Argentina in 1972, under the selected

[3]quoted from Chundamannil, M.(1992), "Sustainable Use of Forests:Citizens' Rights for Effective Control", from *The Price of Forests*, edt. Anil Agarwal, CSE, New Delhi..

theme of "Forests and Socio-economic Development". In 1978, at the Eighth World Forestry Congress held in Jakarta under the theme of "Forestry for People", one important declaration was made: "the World's forests must be maintained on a sustainable basis for the use and enjoyment of all people". Thus, the fundamental concept of Community Forestry or Social Forestry gradually arose and crystalised at the end of the 1970s. Such a basic

changes in forest resources management concept and approach have been penetrated into the government forestry policies, strategies and programs since then, in a form of nation wide community forestry or social forestry programmes, including a vital application of agro-forestry techniques.

In tune with these policy changes, the scheme of 'social forestry' was launched in India with a view to promote forestry in the degraded land area and thereby augmenting the supply of forest products. The principal aim of social forestry has been to increase the plantation area in the common waste land in order to fulfil the basic needs of the rural poor who depend upon forests for various purposes-starting from fuel, fodder, small timber, minor forest products etc. Particularly after the recommendation of National Commission on Agriculture 1976, social forestry and people's participation got momentum. Accordingly during the 7th Plan(1985-90), massive social and farm forestry programmes were taken up; more emphasis was laid on the afforestation of degraded lands and wastelands. But yet the target of achieving one-third of total land area under forests could not be achieved, rather deforestation is still continuing. Realising the seriousness of the situation, the Government of India declared a new Forest Policy in 1988, known as "The National Forest Policy 1988" where it was advocated for maintenance of environmental stability through preservation and restoration of the ecological balance that had been adversely disturbed by serious depletion of the forests of the country. It also clearly mentioned that the industries which are dependent upon forest products as raw materials, must produce on their own. The Policy also called for voluntary organisations to come forward and help in increasing general awareness of the people for

increasing plantation and for developing nurseries in order to provide good quality of plants.

Furthermore, during 1993-94 the Government initiated various steps to follow up the recommendations of the Rio Conference. To evaluate the beneficial and adverse effects of developmental projects and activities, Environmental Impact Assessment(EIA) was made mandatory and the project authorities were to provide information as per the guidelines developed by the Ministry. As a result of this a different era has started where plantation has become a prestigious, fashionable hobby- starting from different departments of Government, both at Central and State level, private organisations, industries and voluntary organisations are involved in plantation activities. To add to the momentum, different foreign agencies, particularly World Bank, USAID, OXFAM, Swedish International Development Agency(SIDA) came forward to finance the plantation programmes to preserve the environment.

In spite of all these actions, the progressive depletion of the country's forest wealth is literally driving the country towards an ecological collapse. Increasing floods, soil erosion, heavy siltation of dams constructed at enormous cost, changes in the micro-climate are the negative consequences of deforestation. Floods are becoming too frequent and their intensity and magnitude of damages to life and property are increasing over the years. There is acute scarcity of fuel wood in the whole country and it is assuming the proportion of a famine-fuel wood famine-in certain parts of the country. To overcome these problems a number of programmes are planned and implemented by the Government with the help of various agents in the active participation of the people.

1.2 Problem Setting & Objectives of Our Study

The growing environmental awareness(i.e. new environmentalism) among the general public, government, industry and business in the 1980s had led the forestry development schemes to assume a special significance in our planned development programmes. With the initiation of social forestry on Common Property Resources(CPR)

in the rural areas to meet the fodder and fuel problems and to preserve/regenerate our environment, the State has been investing more and more resources in this sector. Moreover, during last few years there is a new awakening in our country with regard to investment in forestry projects. Private investors, industries, farmers, foreign governments, and many non-governmental organisations(NGOs) have come forward to invest money in this sector. There are instances where the State is requested to provide some CPR land to them for undertaking afforestations. On the other hand, with increase in population, availability of land is becoming scarce day by day. Hence, of late, it is realised that land should be allocated to those agents who could use it properly and also to those whose project proposals are efficiency in a socio-economic scale. In view of these developments, the challenge before India is how to use its environment at increasing levels of productivity and in a sustainable manner. We must have labour-intensive and employment generating, land and water conservation and afforestation programmes which will certainly improve our environment, green the country and provide employment to people who need it. Such programmes are not just an environmental necessity but also an economic urgency. But in view of involvement of long term investment in these programmes, it is advocated that all such programs should pass a comprehensive socio-economic review in terms of social benefit-cost(SBCA) analysis, which takes into account a comprehensive view of social and economic actions. In all those exercises, both tangible and intangible gains and losses of concerned programmes are investigated. Imputed values are attached to externalities or otherwise non-measurable items of expenditure. The direct as well as indirect costs and benefits are incorporated into the analysis. Under such circumstances, it is imperative to evaluate various plantation schemes not only from the point of view of the organisation undertaking it(i.e. commercial evaluation) but also from the point of view of economic efficiency as well as socio-economic environment. In tune with these new approches in our policy framework, we have proposed in this study to undertake empirical investigations of various forms of forestry schemes with the following objectives:

- to examine the scope of different forms of plantation schemes with the help of case studies;
- to estimate the commercial viability of different schemes;

- to estimate economic viability of those schemes in terms of economic efficiency;
- to estimate the socio-economic and socio-eco-environmental viability of those schemes; and
- to suggest some policy measures for the Government with the help of comparative socio-economic analysis.

1.3 Coverage of the Study

In order to accomplish our objectives, we have selected eight sample projects from four different categories of forestry development schemes in the state of Orissa, which is located in the eastern part of India. While Map 1 shows the location of the State in India, Map 2 shows the location of the project covered by in districts of Orissa, namely, Puri, Dhenkanal, Cuttack. Our study is restricted to a backward state like Orissa which has a large portion of the geographical area under forest coverage. As per the Government Statistics the forest coverage of Orissa is 35.3% of the total geographical area, which is much ahead of the national average. Besides, Orissa has a large number of people tribal people, who mainly survive on forests resources. However, the forest cover in Orissa is shrinking rapidly mainly due to heavy biotic pressure. Nearly 1,34,000 hectares(ha) of forests have been cleared during 1951 to 1983 mainly for agriculture, resettlement, irrigation and power projects, construction activities and industrial uses. The agro-based industries as well the of cottage and village industries depend on forests directly or indirectly for their raw materials. In addition to all these, nearly 90% of the total tribal population(who are mainly forest dwellers) in Orissa depend forest for agriculture and other means of their livelihood. Very often they practise shifting cultivation, which involves denudation of forest. It is reported that around 5298 sq km of forest land have been used for shifting cultivation annually.

In order to preserve its forest and to prevent large scale compensate the deforestation, the Government of Orissa had has been involved in plantation activities through its various agents. The key agents being the different wings of Forest Department,

Soil Conservation Department, and Agriculture Department of Government of Orissa, Orissa Forest Development Corporation, and the industries. In addition to all these, a number of voluntary organisations are also engaged in increasing social awareness of environmental conservation and plantations in Orissa. In spite of so many agents being already involved in plantations, the results are not satisfactory. Furthermore, with increase in number of agents there is tremendous increasing pressure on the Revenue Department for allocation of land for plantations. In view of lack of any uniform standard it is becoming difficult for the Government to decide about to whom the land should be allotted. In such scenario we have made a modest attempt to evaluate different schemes of plantation implemented by various agents with the yardstick of Social Benefit Cost Analysis(SBCA) The SBCA exercise could throw light about the efficient schemes which would help the decision makers as well as policy makers.

Our study has adopted the SBCA method because it is the only method which takes care of every aspect of a project and also it incorporates all the planned goals into the analysis. Moreover, it is capable of integrating the financial, economic, socio-economic, environmental, and ecological aspects of any typical forest development project in the context of our economic development.

As regards the methods of SBCA, the literature survey reveals that there are four broad methodologies, viz. the OECD Manual method, the UNIDO Guidelines method, the Effects method and the World Bank method. Among those four methods we have preferred the UNIDO Guidelines method rather than other methods because UNIDO Guidelines offers a more thorough treatment of Cost-Benefit Analysis applied to poor countries than can be found today in any other volume or monograph. Moreover, as the UNIDO Guidelines is based on partial equilibrium approach, it is best suited to a country like India which has adopted partial planning. Owing to these merits we have adopted the Guidelines approach with few modifications in estimating the costs and benefits of various forestry schemes. More specifically, our approach is an extension of UNIDO Guidelines approach in terms of our attempt to quantify the externalities about which UNIDO Guidelines has been pessimistic. Since forestry development involves a lot of positive

externalities, in our socio-economic evaluation we have tried to quantify some of those externalities in two steps. In the first step, we have tried to calculate the fuel and fodder benefits(which are not marketed) of plantation projects by applying the Contingent Valuation Method(CVM)[4]. In the second step our attempt has been to include the environmental and ecological benefits through a method of approximation in which we have borrowed the estimates form various studies dealing with the ecological and environmental quantifications.

1.4 Structure of the Study

This study has been divided into 10 chapters and the structure is as follows.

While chapter 1 introduces the problem and our objectives, chapter 2 deals with scope of forestry in economic development. Starting with the growing environmental awareness in the World, we have discussed the significance of environment for economic development, and particularly we have analysed the scope of forestry in economic development. In order to attain sustainability in forest resources the role of regulation is being examined from welfare economics point of view. Besides, the role of forests in inter-industry analysis and its impact on environment are also discussed vividly. Further the studies dealing with forest management are reviewed. The chapter also highlights our justification in undertaking SBCA of various forestry development schemes.

The programmes and policies of forest development in India, the scope of forest development and the various measures adopted by the Government of India are discussed in chapter 3.The constraints and prospects of forestry in India are also discussed and the possible way-outs are examined in the chapter.

In view of our study covering the State of Orissa, chapter 4 deals with the growth pattern of forest and forestry in Orissa. We have also examined the scope of forest development, described the role of forest and the organisational structure of forest

[4] CVM will frequently be the only method of external benefit estimation(Pearce and Markandya,1984)

department, and also forest development programmes under Five Year Plan's by different agencies in Orissa.

The methodology adopted in the study along with the scope of SBCA, its historical development and further its scope in forestry sector are examined in chapter 5.Tha chapter also covers the theoretical framework, sample selection, the method of data collection and analysis.

The next four chapters deal with our case studies in terms of SBCA while chapter 6 deals with two sample projects under the social forestry schemes, chapter 7 covers two block plantation projects of the territorial wing of the Forest Department of Government of Orissa. Similarly, two sample projects of the Cashew Development Corporation are covered in chapter 8 and chapter 9 deals with two plantation projects of two industries.

The last chapter provides a summary of findings of all the chapters. With the help of the results of our case studies some policy implications are drawn with a view to help the policy-makers in the planning process. Last but not the least the scope for further research is also discussed in this chapter.

Chapter 2

SCOPE OF FORESTRY IN ECONOMIC DEVELOPMENT

2.0 Introduction

It is well established in the development literature that for sustainable growth of an economy, the environmental aspects of various projects(in terms of natural physical environment including forests, socio-economic environment, biological and political environment) must be examined thoroughly. The hypothesis that environmentalism is good for promoting growth and to ensure better quality of life has been stressed in various international forums as well as in the writings of many futurologists and by environmentalists.

Recognising this vital role of environment to ensure better quality of life, the UN Declaration of 1972[1] had stated:

> "Man is both a Creative and Moulder of his Environment which gives him the opportunities for Intellectual, Moral, Social and Spiritual Growth.....Both Aspects of Man's Environment, the Natural and the Man-Made are Essential to his Well-Being."

In the same vein the Governing Council of the UN Environment Programme,(1975) had approved:

> "When the process(of development) is such that it takes account also of the Effects on the Environment and provides Well-Being and Viability in a Sustained Manner. It constitutes the Management of Environment."

Even the Marxian framework of development had predicted that man's attempt to conquest over nature through technological progresses would threaten to destroy all life on earth. Hence, Frederick Engels had warned "Let's not, however, flatter ourselves over much on account of our human victories over nature. For each such victory nature takes its revenge on us. Each victory, it is time, in the first place, brings about the results that

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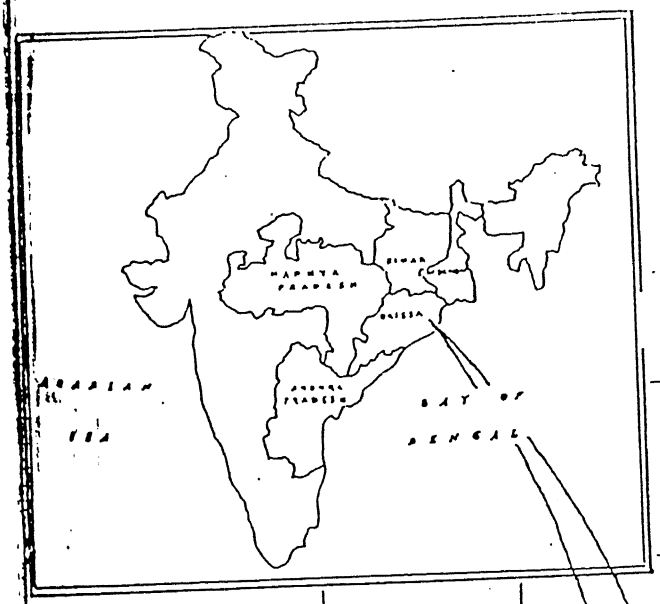
[1] Declaration of the UN Stockholm Conference 1972.

Map 1: Location of Orissa in India



Map 2: Location of Project sites in Orissa

Note: The numbers indicate the project sites.

(I). Gopalpur (II). Mundal (III). Balukhanda -C11 (IV). Balukhanda -C13 (V). Ranpur (VI). Kadamjhola (VII). NALCO(Angul) (VIII). BILT(Choudwar)

are expected but in the second and third places, it has quite different unforeseen effects which only too often cancel the first."

In the same tone other futurologists like Toffler, Tinbergen, Mishan and Kahn had warned that unless the environment is protected, there will be catastrophic development in the economy. To quote Alvin Toffler:

> In our haste to milk technology for immediate economic advantages we have turned our environment into a physical and social tinder box.(Toffler in *Future Shock*, 1970)

The Club of Rome, of which Jan Tinbergen was the co-ordinator, had too proposed that:

- the unprecedented scale of human interference with nature and ecological balances might prove disastrous to all;

- our life-support systems are under unprecedented attacks from the combined effects of urbanisation, industrialisation, agriculture and our daily life styles.

Similarly, participating in the Economic Growth Debate, Mishan(1977) had viewed that:

> "The more Science, Technology and the GNP grow, the more nasty, brutish, vile and precarious become human existence."

Furthermore, Herman Kahn in the "World Economic Development:1979 and Beyond" has expressed his concern that:

- We are in the midst of a Great-Transition;
- Human society is changing at an accelerating pace;
- But the future will not be problem free;
- Natural, social, political forces are likely to slow the growth of population and production(*Anti-Growth Argument*);
- We do not rule out the possibility of an overwhelming catastrophe.

In view of these prophecies, the attention of the policy-makers and planners have been shifted from low cost effectiveness to comprehensive environment impact assessment. With the passage of time the environmental impact has undergone drastic changes-from local level to global. While in early days the local environmental issues like epidemics, bacterial contamination were focused, subsequently it gave rise to regional problems like

deforestation, accidental spills, algae blooms, fish kills etc.. However, in recent years continental problems like wild life deformities, acid rains etc. have come to lime light in policy making. Besides the global issues like loss of bio-diversity, global warming, ozone depletion, water shortages, population explosion have become the key concerns of today's World. These sequential changes have called for regulatory actions in order to have sustainable development both in the developed and developing countries. Owing to these developments, the countries are advised to reorient their policies and programmes towards sustainable growth path.

Thus, the developing countries are rejecting the old-fashioned development-versus-the environment paradigm in favour of a new environmentalism, which recognises that economic development and environmental sustainability are partners. It is also well established that environment plays a key role in economic development of a country.

2.1 Mainstreaming the Environment for Economic Development

With the changes in the concept and definitions of economic development, whereby the growth of GNP/per capita income no longer holds as the index of development of a country, today greater emphasis is accorded on quality of development and also on attainment of social goals in terms of social welfare. Thus, now-a-days economic development is generally understood as a process of societal change which contributes to economic, social, physical and moral well being of all segments of a society and fulfilling their satisfactions and objectives. It is a concept almost synonymous with over all improvement in the quality of human life. Moreover, in recent years a growing awareness about the environmental conservation/ protection to ensure a better quality of life has focused on the special role that environment can play in the economic development of a country. The planners and policy makers have realised the close dependency between economic development and environment(i.e. in terms of their mutual compatibility)[2].

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[2] Rath,B(1990), "Environmental Hazards of the Talcher Industrial Complex and their Socio-economic Impacts in the Brahmani Flood-Plain", edt. in Environmental Impacts of Industrial and Mining activities by LN Patnaik, Ashis Publishing House, New Delhi.

To add to it, the recent economic view of environment that it is a kind of mutual asset for non-reproducible capital good that produces the stream of economically valuable direct and indirect goods and services for man(in the form of tangible, intangible and functional) has convincingly shown that there can be no rational and equitable economic development without environmental conservation. Conservation and economic development should ideally be directed towards a common goal-the rational use of earth's resources to achieve the highest quality of living for mankind. In practice, economic development tends to place stronger emphasis on quantitative increases of production, aimed at enhancing the material well-being of people, whereas conservation while concerned with sustaining quantitative yield, also emphasises management of more qualitative aspects of the human environment which can add depth and meaning to human life. Lack of consideration for the ecological realities of an environment can doom development efforts, with consequent waste of money and impairment of the conditions of life, just as surely as if the technological, economic, political or social factors were to be ignored. Thus the environmental concerns have been integrated in our holistic development planning.

With a view to integrate environment to economic development, the World Bank has highlighted the environmental problems of the World and have introduced a number of remedial measures. More particularly, it had concentrated on environmental abatement and improvement in developing countries. In its Annual Report, 1992 it had investigated the environmental problems of the World as a whole and it had described the environmental problems as following:

(a) only half of the world's population breathes healthy air;

(b) one-third of population has inadequate sanitation;

(c) one-billion are without safe water;

(d) 1.3 billion people are exposed to unsafe conditions caused by smoke;

(e) 300-700 million women and children suffer from severe indoor air pollution from cooking fires;

(f) the annual increase in the world's food production is only half the world's population growth;

(g) hundreds of million of farmers, forest dwellers(tribals) and indigenous people who relay on the land and whole livelihood depends on good environmental stewardship are being handicapped;

(h) soil erosion can cause annual economic losses ranging from 0.5% to 1.5% of GNP;

(i) one-quarter of all irrigated land suffers from salinisation;

(j) tropical forests-the primary source of livelihood for about 140 million people-are being lost at a rate of 0.9% annually;

(k) about a hundred species of plants and animals are predicted to disappear every day.

Based on such facts, some world leaders have claimed a plausible cause of an eventual Third World War due to environmental degradation, which may lead to vast streams of environmental refugees. It should be emphasised that this level of environmental concern is unique in the history of planetary evolution. It may affect all of us and our possibility of surviving as a human race. Therefore, the World's population must be united in this struggle for survival. Development of environmentally-efficient technologies, participation of the individual, and a change in our thinking and behaviour should help guide us to a sustainable path to ecological stability, bearing in mind that equity and justice ought to prevail within and between human generations.

Besides these problems, the World Bank had identified new challenges of the World, namely;

- lack of life sustaining facilities;
- population explosion;
- urbanisation;
- rapid industrialisation and consequent problems;
- marked degradation in environmental quality i.e. how to protect and regenerate the environment;
- poverty eradication;
- how to reduce religion/class/caste/clan social conflicts; and
- how to achieve sustainable development.

However, the causes of environmental degradation are attributed to:

- industrialisation and urbanisation;
- extensive/intensive agricultural operations;
- depletion of traditional sources of energy and raw materials;
- the rapid technological progresses in production;
- constant population growth;
- disruption of natural ecological balances;
- destruction of economic ends of various animal and plant species; and
- the negative genetic consequences of individual and other pollutants which include the danger of man's genetic degeneration.

Another factor which had contributed to environmental degradation is the inappropriate strategy of development, which adversely affects environment, undermines health, slows down development and has negative impact on environment. The inappropriate strategy has further depleted the scarce natural resources. Thus, in recent years the focus is on conservation and optimal use of the natural resources.

Whereas earlier, conservation of natural resources implied non use of resources, now-a-days, resource conservation is gauged in terms of optimum or efficient inter temporal use of natural resources. As regards the forms of natural resources which need to be conserved, there are three types of natural resources; viz.,

- renewable,
- non renewable, and
- capital resources.

The renewable resource is one for which the stock can either increase or decrease. Increases are obtained through natural reproductive or recharging mechanisms which can possibly be altered through resource management practices. Examples of such resources are forests and fisheries. A non renewable resource is one for which the stock can only decrease. The third one is capital resources or non renewable resources with renewable service flows. These are resources that are available in quantities not affected by the rate at which they are exploited. Examples are solar and wind energy.

Since the objective of our study is to investigate the nature and use of a natural resource like forests, let us examine the scope of forestry in recent development debate.

2.2 Scope of Forestry in Economic Development

As highlighted above since the focus of development has changed from higher growth to sustainable development, the international agencies as well as policy makers have laid stress on conservation and regeneration of the natural resources like forest[3]. Underdeveloped countries, embarking on programmes of economic development, "usually have to begin with and concentrate on the development of locally available natural resources as an initial condition for lifting local levels of living and purchasing power, for obtaining foreign exchange with which to purchase capital equipment, and for setting in motion the development process."[4]

Forest as a form of renewable natural resource has a great role in the development of an economy as natural resources are the basis of national prosperity, power and wealth.. Particularly, for a developing economy forest has a pivotal role in terms of its significant contributions to national income, employment generation, tribal area development and above all in terms of socio-economic upliftment of the poor people. Its contributions are broadly divided into direct benefits and indirect benefits. The direct benefits, otherwise known as economic benefits comprise of: (i)fuel, fodder, small timber, minor forest products, (ii) timbers and raw materials for industries, and (iii) employment potential. These are nothing but productive values of forests. On the other hand, the indirect benefits

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[3] The word 'forest' is derived from the latin word *foris* meaning outside the village boundary or away from inhabited land. Forest is a large tract covered with trees and under growth sometimes mixed with pastures. Generally, forest is referred to an area occupied by different kinds of trees, shrubs, herbs and grasses maintained for the production of wood and non-wood products. Ecologically, it is defined as a plant community, predominantly of trees and other woody vegetation, usually with a closed canopy. Legally, forest is an area of land proclaimed to be a forest under forest laws.

[4] Fisher, J.I.(1964), "The Role of Natural Resources in Economic Development:Principles and Patterns", Eds. H.F. Williamson and J.A. Buttrick, p.32.

of forests are nothing but the social and environmental benefits. They help to maintain the ecological balance of nature. These are collectively referred to as the protective and social functions of the forests.

Recognising these importance, less than a year before the Rio Earth Summit, the World Bank adopted a new forestry policy(1991) that addresses the challenges of excessive deforestation in tropical forests and inadequate investments in tree planting and forest management. The policy recognises the range of competing uses for the forest as a resource, the importance of macro economic policies and policies in other sectors for forest management, and the fact that many forest problems result from inappropriate policies and market failures that lead to excessive harvesting and insufficient incentives for planting trees and managing forests sustainably. The policy calls for the reform of policies, institutions, and investment priorities and for significant changes in how forests are increased its support for activities in the sector; till major pieces of sector work have been undertaken, and during the past four fiscal years the Bank has committed $1.7 billion for an additional 26 forestry projects, in contrast to total support of $2.6 billion for 97 projects prior to 1991. The policy emphasises the inter-sectoral links affecting forests by encouraging more effective collaboration among traditional forestry services, agricultural extension agencies and non-governmental organisations(NGOs). Such an approach implies that forest policy in rural areas needs to be inextricably linked to the planning and implementation of agricultural, household energy, population and other sectoral activities. Four additional principles[5] also guide the Bank's work in the sector.

- *Rectify market and policy failures that encourage deforestation and inhibit sustainable land use*, by promoting sector policy and institutional reform and by seeking to bring a more realistic assessment of resource values into decision making.

- *Give special emphasis to expanding public participation in forest resource planning and management and mobilising private sector resources and skills,* by encouraging greater stakeholder participation in forest management and planning, and by increasing support for alternative livelihoods for the rural poor living within forest boundaries.

[5] The World Bank(1995), "Mainstreaming the Environment", Washington, D.C.

- *Expand and intensify the management of area suitable for sustainable forest production,* including establishing plantations to reduce pressures on the existing base of forest resources where the scope to do so is sound from a social, environmental, and economic perspective, by low-cost technical improvements as well as farmer training.

- *Expand the designation of forest areas as parks and reserves* by adopting and encouraging borrower governments to pursue a precautionary approach to forest use, particularly in tropical moist forests, by increasing the share of lending for this purpose.

The above mentioned arguments of the Bank establishes that if forests are ideally dispersed, scientifically managed and judiciously utilised, they can be perpetually productive and useful and can confer many benefits, both direct and indirect, to the people. Further it highlights that forests of a country are renewable natural assets of immense value, which if preserved and regenerated can immensely help the future generations.

2.3 Value of Forest Resources

The value of forest resources can be classified into the following groups:

(I) Direct Value

(a) Consumptive Use Value

(b) Productive Use Value

(II) Indirect Value

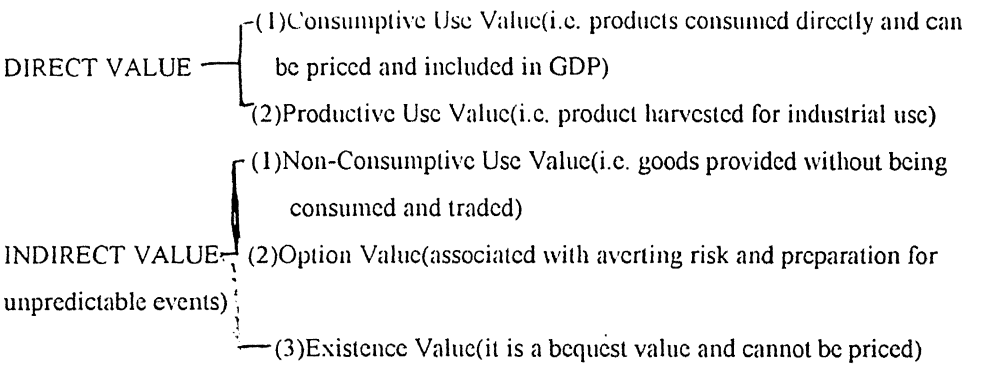
(a) Non-consumptive Use Value

(b) Option Value

(c) Existence Value

The concepts are schematically shown in Chart 2.1.

Chart 2.1: Direct and Indirect Use Value of Forest Resources



The consumptive use value includes the major forest products like timber, and other products like fuel, fodder, minor forest products which are directly consumed whereas the productive use value includes the products which are used in the industry as raw materials. The productive use aspect is elaborated in terms of inter-industry analysis in the later sections of this chapter.

In terms of indirect value, the non-consumptive use value includes the environmental services which are neither consumed nor traded, but at the same time these are very much necessary for human existence. These use values are generally not priced in the market. The examples of such non-consumptive value are the capacity of forests to preserve the physical features of the earth, to improve the climatic and hygienic conditions of strategic value. By providing shelter to the wild life forests also maintain the ecological balances; this value cannot be priced. Thus forests play a various role which are very difficult to be estimated in economic terms.

Moreover, forests have the capacity to control natural calamities like floods and droughts; this role is nothing but its option value. On the other hand, the recreational value or the aesthetic aspect of the forests are the existence value.

The environmental problems and concerns in the World since 1970s have highlighted that all these use values of forests are depleting due to large scale

deforestation. Therefore, in various international forums it is argued that comprehensive environmental policies are to be pursued by the Governments, which calls for rational decision-making processes. The related areas of concern-i.e. technology, economy, ecology, trade, and legislation are ought to be included in planning and decision-making processes. Furthermore, the interplay in the field of environmental protection should be weighed and evaluated before taking up any project. The policy planners should adopt a definite criteria to evaluate the environmental projects with a focus on welfare implications, inter-industry linkages and above all in terms of the socio-economic and environmental impacts in the local, regional and national perspectives.

2.4 Scope of Welfare Economics in Forestry Management

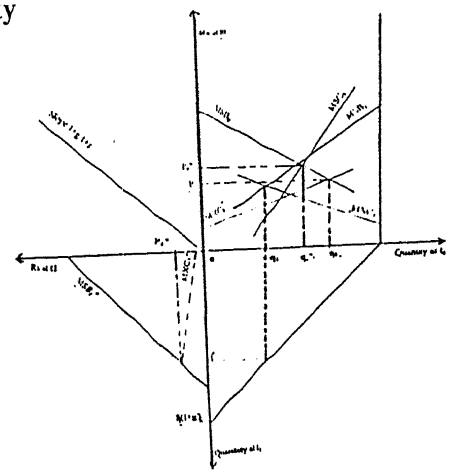
Since the focus of development has changed from higher growth to sustainable development, the policy makers have laid stress on conservation and regeneration of the natural resources like forests. With the rise in population, industrialisation, and infrastructure development which resulted in depletion of forest resources, the situation has been largely changed. A new awareness has been generated through out the World and a great debate is generated about 'sustainable forest management' which is based on welfare economics. While the initial emphasis of sustained yield was on output maximisation(maximum sustained yield), it has gradually shifted to value maximisation(maximum economic yield) and recently it has been replaced by the concept of socially optimum yields(optimum sustained yield). Forest laws, foresters and academicians have defined sustained yield differently to suit the economic conditions of particular societies and forests of particular regions. After a review of the available definitions, Wiebecke and Peters[6] have defined forest sustenation as 'the endeavour to facilitate the continuous and optimal provision of all tangible and intangible effects of the forests for the benefit of present and future generation'. To attain sustainability in forest resources regulation is needed in order to apply social justice to future generation compared to present one.

[6] ibid

Since regulations are needed in the policy questions involving determination of resource management practices that improve the flow of goods or services over time as well as that determine the optimal rates of use to balance consumption inter temporarily, let us elaborate these graphically.

Consider a two period allocation problem. Define g as the rate at which one unit of the resource will grow from time t_0 to time t_1 if unutilised at time t_0. Thus, if $\bar{q}$ is the total stock of the resource at the beginning of the time period t_0 and q_0 of this stock is utilised for current consumption in time t_0, the stock of the resource available at time t_1 is $(\bar{q}-q_0)(1+g)$. As shown in Fig 2.2 the right axis measures quantity at time t_0 where $\bar{q}$ is the total available stock. If none of the stock is utilised at time t_0, it will grow through regeneration to a stock of $\bar{q}(1+g)$ by time t_1 as on the lower axis. MSB_0 represents Marginal Social Benefits of using resource in the current period; MSB_1^* measures the marginal social benefits in a future period. MXC_1^* is the marginal cost at time t_1 while MXC_0 is the marginal cost at time t_0 .

Figure 2.2: Regulation for Sustainability



Under perfect competition the equilibrium price is P_0 and utilisation is q_0 at time t_0 . Equilibrium at time t_1 would lead to price P_1^* and quantity q_1^*. However, to utilise a quantity of q_1^* at time t_0, a resource stock of at least $\bar{q}-q_1$ must remain unutilised at time t_0. This would not be the case if q_0 is utilised at time t_0. Thus utilisation at time t_0 imposes

an externality at time t_1. It suggests that without regulation forests may be overcut at the expense of future generation. Hence, with renewable resources there are user cost associated with decisions to produce now rather than latter.

To properly consider user cost in determining inter temporal marginal social cost at time t_0, we use social discount rate r and growth rate g. The MSB_1 is derived by deflating the MSB_1* by a social discount rate of r but then inflating by a rate of g because if one unit is not used at time t_0 then (1+g) unit is kept for time t_1. The marginal cost MXC_1 is derived similarly. The marginal social cost at time t_0 is obtained as

$MSC_0 = MXC_0 + MSB_1 - MXC_1$

Thus, social optimality at time t_0 implies that marginal social benefits at time t_0 must be equal to the sum of marginal cost at t_0 and marginal user cost. This marginal user cost in case of renewable resources has two distinct components:

(1) the marginal scarcity value and

(2) the cost imposed on future generations of reduced resource regeneration.

Social optimality is obtained where $MSB_0=MSC_0$ or at quantity q_0*. This can be obtained by a tax at q_0* (equal to vertical difference in MSB_1 and MXC_1) or by establishing a regulated price P_0* or regulated quantity q_0*. Thus, regulation is necessary in order to apply social justice for future generation.

Forest regulation is also deeply embedded in modern forest management and strongly relate to the concept of sustained yield. According to Davis(1966),

> "The essential requirement of a fully regulated forest are that age and size classes be represented in such proportion and be consistently growing at such rates an approximately equal or periodic yield of products of desired size and age class so that harvestable trees in approximately equal volume are regularly available for cutting."

Although this definition clearly considers forest products in the sense of things that can be manufactured from trees, forest regulation can be viewed in a broader context that

considers all valid uses of the forest as 'products'. Thus, forestry is considered as an industry where we invest and get output. Recreation, wildlife, forage for grazing animals, aesthetics, water, air quality, and a myriad of other products are the output from the forest. As regards regulation models, the literature shows that the first systematic regulation model was developed by Johnsoan and Scheurman(1977) of the Forest service of U.S. Department of Agriculture, which was termed as Timber Resource Allocation Model(RAM). However, the structure of this model was originally suggested by Kidd et. al(1966). The model was helpful in fulfilling objectives like value maximisation, physical yield maximisation or production cost minimisation. In addition to these objectives the main objective i.e. regulating forests was also attained through this model.

2.5 Role of Forests in the Inter-Industry Analysis

As explained earlier, forest meets the needs of timber, small timber, fuel, bamboo and a variety of other products, including fodder which are indispensable requirements of the people living in close proximity of the forests. It also provides facility for the grazing of the livestock. In addition to these benefits, forest is an important sector in the Inter-Industry Analysis since it provides inputs to various industries-both directly and indirectly. In India, wood and other products serve as basic raw materials for several industries. While wood is needed for paper pulp, newsprint, rayon, furniture, matches, etc., timber is needed for constructions, industries, defence, communications, railways and other national purposes. In India, the demand of industrial timber and pulp wood, as estimated by Forest Survey of India is around 27 million cubic metre(mcum) whereas the production is estimated to be around 6mcum, leaving a large gap between demand and supply. In order to bridge the gap between demand and supply of timber, in recent years, there has been a quantum jump in the import of timber. The bulk of the import has been of hard wood logs from tropical countries. But this trend may not continue very long because of the large scale deforestation problems in those countries.

Besides providing raw materials for pulp, forests are the source of a number of minor products like bamboo, canes, grasses, essential oils, resins, medicinal plants, lac, gum, tanning materials, dyes, etc. There is a great scope for the establishment of minor forest products(MFPs)-based cottage, small and large industrial units by tribal. The industries which are based on MFPs are oilseeds industry, essential oils, ayurvedic drugs, gums and resins, industry for tanning extracts and katha and cutch manufacturing, industries based on sisal and other forest fibres, bamboo and cane industry, industries based on edible plants and miscellaneous industries i.e. making leaf platters, bowls, bidi manufacturing, agarbati, pine wool, oxalic acid from bark of trees and manufacture of various articles from horn and bones. In addition to MFP based industries, tribal areas have great opportunities to develop wood based industries like wood carving, toy making, sports goods industries, industries for making agricultural implements, etc. Thus forest products also secure a place in the inter-industry analysis. By taking the case study of the Indian economy we have examined the role of forest products in the inter-industry analysis.

To study the importance of forestry sector we made use of the Input-Output tables[7](viz. 1979-80, 1984-85, and 1989-90). The adjusted inter-industry flows of forestry sector to other sectors of the economy are shown in the following table.

Table 2.1: The Inter-Industry Flows of the Forestry Sector of India at 1984-85 Prices

Commodity Sectors	1979-80	1984-85	1989-90
1.Cereals	0.740	14.457	4.219
2.Fibre Crops	0	0	0
3.Tea & Coffee	0	0	0
4.Other Crops	0	1.678	0.239
5.Animal Husbandry	0	0	0
6.Forestry & Logging	0	0	85.748
7.Fishing	0	0	0
8.Coal & Lignite	0	0	0
9.Crude Petroleum & N.Gas	0	0	0

[7] Input-Output tables of India made available by the Central Statistical Organisation, and Planning Commission, Government of India

10.Iron Ore	0	0	0
11.Other Minerals	0	0	0
12.Sugar	0.494	32.823	147.452
13.Khandasari, Gur & Boora	85.703	126.599	159.634
14.Other Food & Beverage Industry	237.598	168.842	190.446
15.Cotton Textiles	88.914	24.805	130.493
16.Art Silk & Synthetic Textiles	0	4.891	51.274
17.Woolen Textiles	13.337	2.276	15.207
18.Other Textiles	6.175	37.005	15.525
19.Wood & Wood products	3223.629	1749.518	13075.39
20.Paper & Paper products	430.986	569.457	1570.024
21.Leather & Leather products	242.784	67.004	515.844
22.Rubber products	4.939	5.506	16.879
23.Plastic products	0	0.161	2.070
24.Petroleum products	0	0.853	68.551
25.Coaltar products	1.482	3.705	28.583
26.Fertilisers	1.482	0.799	20.302
27.Pesticides	0	0.124	0.796
28.Synth.Fibre & resin	700.445	107.825	281.369
29.Other Chemicals	176.593	324.172	914.728
30.Cement	0	0.544	1.990
31.Other Non Metal products	386.282	383.836	568.869
32.Iron & Steel	18.524	50.335	220.541
33.Nonferrous metals	67.673	16.052	19.267
34.Non electrical machinery	54.583	54.965	419.824
35.Electrical machinery	7.162	17.127	18.153
36.Rail Equipments	43.222	33.667	159.315
37.Motor vehicles	12.102	16.819	62.490
38.Other transport Equipment	24.698	102.424	63.535
39.Electronic & Communication Equipment	1.976	2.907	11.783
40.Other Manufacturing	327.747	57.696	261.066
41.Rail Transport Service	0.246	0.268	13.057
42.Other Transport Service	0.246	0	0
43.Electricity	1.235	0.514	0
44.Construction	7526.576	3991.299	10862.09
45.Communication	0	0	0
46.Other services	0.988	0	237.499

Note: Figures are in lakh rupees

An examination of the coefficient values of various sectors of the economy reflects that the sectors construction, wood and wood products, paper and paper products, textile, synthetic fibre and resin, leather and leather products, khandasari and boora, other food products are the heavily dependent sectors on the forestry sector.

2.6.1 Impact of Forest on Environment

Forests have a decisive bearing on our natural physical environment by way of preserving land, water, vegetation, climate, and hydrology. They also contribute to our socio-economic environment by way of contributing to GNP, employment generation, group and regional income redistribution, self-sufficiency and other planned objectives. Forests further help in preservation of our cultural environment by promoting recreation opportunities and by developing aesthetic values. The Hindu philosophy has recognised the five basic ingredients of creation, viz., Kshiti, Jal, Pavak, Gagan, and Samir which refers to land, water, energy, space and air respectively which constitute our environment. It is visualised that life on this planet earth is dependent on the balanced management of these resources. Since forests play a significant role in maintaining all these basic resources, various assessments for the environmental services rendered by forests have been computed and if all these beneficial effects of forests on environment are accounted in cost benefit analysis, the value of benefits for environmental impact alone may out-class the costs involved in development of forest.

2.6.2 Impact of Forest on Land

It is well established that forests are the key resources to preserve the quality of land. As deforestation implies the loss of quality due to soil erosion, any regeneration of forest will lead to control the loss of soil quality. A comparison between barren land and forested land with regard to the erosion potential after a single heavy rainfall shows that soil loss from barren land can be 800 times more than that of forested land. According to Dr Swaminathan[9] about 6000 million tonnes of top soil is washed or blown away annually. If evaluated in terms of soil nutrition(NPK) losses, the loss has been estimated at Rs.12,000 million annually[10]. Thus, any permanent vegetation cover on land is capable of reducing soil loss due to erosion effects. It also helps in replenishing the soil with essential nutrients by decomposition and decay of its litter (dead leaves, twigs etc.). According to Indian

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[9] Swaminathan. M.S.(1975). "The Ecologist", June 1975.

[10] Shankar and Ranganathan(1979), "Agro-forestry: Employment for Millions", Tata Press Ltd.

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Forest Research Institute(IFRI), Dehradun, the value of benefits in terms of controlling soil erosion and fertility works out to Rs.2.50 lakhs per tree during 50 years of tree's life span. It takes hundreds of years for the generation of even 1 centimetre of top soil to be formed[11]. Soil fertility and structure are also improved by substantial inputs of nutrients and organic matter into the soil. The binding action of roots further helps in stabilising sites. Thereby any macro level afforestation projects could make a major contribution to slope stabilisation.

2.6.3 Impact of Forest on Climatic Stability

Forests serve important functions as climatic stabilisers. As we know, trees remove carbon dioxide from the atmosphere and produce oxygen and wood and also absorb water and regulate run off. Disturbing this ecological cycle may change at least the local climate, and the accumulation of many local effects may have wide implications for regional, national and even global climatic stability. In the short term, deforestation may cause change in precipitation that can severely affect agriculture which is the key sector of any underdeveloped and developing economy. More dramatically, the long term scenario includes global warming and sea level rise due to increased release of green house gases, among them carbon dioxide from burnt wood.

2.6.4 Impact of Forest on Hydrology

As far as hydrology is concerned, rainfall is the primary source of water supply and hence any change in the ecological system either through deforestation or any other human activity has a direct bearing on the hydrological regime by making appreciable changes in water infiltration, resulting in higher run off in up stream flow and soil loss. Some studies have shown an increase in the run off by 40% in areas cleared of its vegetative cover. It has been estimated that the country receives 370 million hectare metres of rain fall each year. Around 20% of the geographical area of the country is reported to be under actual forests[12] which is estimated to absorb nearly 49 million hectare metres of water[13]. In terms

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[11] Deoras. P.J.(1986), "Forests: A Victim Through History", The Economic Times, Nov2, 1986.
[12] Forest Survey of India(1989), "The State of Forest Report".
[13] Soni. P et al(1990), "Reclamation of derelict land-Ecological impact", The Economic Times, April 5th.

of monetary value, IFRI estimated that each tree contributes nearly Rs.3 lakhs in a 50 year life span, in terms of recycling of water and controlling of humidity.

Foliage intercepts and reduces the impact of rainfall and wind erosion and serves as shade to minimise water loss through evaporation thereby improving the soil moisture regime. These effects may be viewed by the village communities as productive rather than ecological benefits since it helps in improving their agricultural productivity either through increased soil moisture during the crop period or in taking up additional crop in the subsequent season.

2.6.5 Forests As A Component of Biological Diversity

The tropical forest is an extraordinary source of genetic diversity. For example, Ecuador has a land surface of only 3 percent of Europe's, but harbours 20-50 percent more plant species. This diversity is not merely a gemstone for the conservationist, but it has immediate hard currency implications. One fourth of the prescription drugs used in the USA are derived from tropical forest plants. In the case of India, D'Monte[14] has forcefully argued for preservation of untouched tropical forests like the Silent Valley, Kerala as a laboratory of genes. Still, biological diversity generally carries little weight in the management of forest resources. The basic reason is that it is a public good which is difficult to claim ownership for. The issue is extremely complex and has simply not been the focus of much research among economists.

2.6.6 Recreational Value of Forests

As a contributor to economic growth and development, eco-tourism is particularly attractive to economic planners. Managed properly, it allows the conservation of biodiversity, provides a financial return to conservation, confers local employment opportunities and compensates local communities somewhat for the denial to them of some natural resources. These benefits are particularly important in developing economies. Lindberg(1991) estimated that the 1988 return in developing nations from nature-based

[14] D D'Monte(1985), "Temples or tumbs? Industry versus environment: Three Controversies", Centre for Science and Environment, New Delhi.

tourism was US $12 billion. Tourism involving national parks and beaches is the most important export and earner of foreign exchange for Kenya.

Recreational values of forests are recognised as significant in both protected and multiple use forestry. For example, in the USA with the value of recreation taken by the Forest Service to range between $6.5 and $12.5 per visitor day, depending on location and other related conditions. it can be seen that recreation is the largest single source of value in the National Forest System, amounting to an annual value of around $1.5 to $2.0 billion, compared to less than half that amount for timber[15].

In a nut shell the direct and indirect goods and services of forest which add to the economic environment are shown in tabular form as follows.

Table 2.3: Goods and Services of Forests

GOODS	SERVICES
Fire wood	Soil conservation
Pulp wood	Protection and regulation of water
Timber	supplies.
Food(Tubers, flowers, seeds, & gums)	Amelioration of climate.
Non-edible oils.	Shelter from hot and cold winds
Medicines.	Absorption of dusts and noise
Fibres and flosses.	Maintenance of the pool of genetic
Resins	resources
Lac	Habitat for wild lives
Tendu and other leaves	Recreation
Bamboo and canes	Maintenance of Carbon Dioxide
Fodder	balance in the atmosphere

While these forest goods are basic sources of income to an economy, the services are indispensable for the society in terms of their positive contributions on environment.

[15] Bowes, M.D. and Krutilla, J.V.(1989), "Multiple-Use Management: The Economics of Public Forest Lands", Resources for the Future, Washington, D.C.

The forest goods are further used to aid our agriculture, industry, and tertiary sectors and thereby promote our socio-economic environment.

2.7 Employment Potential of Forests

Forestry, in all respects, is a long term activity. Tree growing and creation of awareness of its benefits are equally time-consuming tasks. The primary short-term benefit of forestry is therefore employment, and mainly short-term daily wage employment. Particularly, forests provide employment to a large population engaged in their protection, tending, harvesting and regeneration and also in ancillary occupations like processing forest raw materials and marketing them. The study by Olsson(1988)[16] concludes that employment is the only measurable benefit received directly by the intended beneficiaries, i.e. the weaker sections of the society. Shiva[17] has estimated that MFP based industrial development in Bihar alone can generate annual employment of about 37.5 million person days directly and 16.5 million person days indirectly.

Further Julian Evans(1982)[18] adds that the role of production forestry in providing employment in rural areas, where there is often large scale unemployment, underemployment and poverty, is an important consideration in assessing the developmental value of forestry. The secondary effect of employment generation is the increase in purchasing power of the rural work force and thereby it provides a base for an economic upsurge. Joshi and Agnihotri(1983) had argued that it would help in alleviating rural poverty and may also check migration[19] of rural labour to urban areas.

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[16] Olsson, Gunilla(1988), "Employment and Income Generation in Social Forestry", ILO, Geneva.

[17] Shiva,MP(1992), "Minor Forest products in the Tribal Economy-Programmes, Problems and Prospects", The Price of Forest, CSE, New-Delhi.

[18] Julian Evans(1982), "Plantation Forestry in Tropics".

[19] Joshi, PK and AK Agnihotri(1983), "Ex-ante Assessment of Afforestation for Fuelwood on Waste Lands-A Multi Objective Programming Approach", Indian Journal of Agricultural economics", Vol.38, No.3, July- Sept, 308-316.

Thus the role of forests is complex- at one end it is a source of revenue and hence exploitation is natural; at the other end it is needed for environmental conservation and hence it should be maintained. Maximum exploitation of natural resources was, until recently, considered to be a desirable objective and the resulting pollution of air, water and land was accepted as unavoidable. But it is now widely recognised that the development effort can also produce unanticipated and undesirable consequences. The negative consequences have been attracting attention and many critics blame past technological decisions. The natural environment is no longer considered a free and inexhaustible resource and it is being increasingly accepted that all human activities which impinge upon the natural environment must be controlled and properly managed.

Several critics, however, argue that environmental conservation is a block in the path of development. The cost of conservation and pollution control is so prohibitive that a rapid pace of development cannot be sustained. It is also felt that the imperative of environmental conservation being adopted in developed countries today cannot be transplanted on to developing nations.

The basic flaw in these arguments is that they presume that economic development and environmental conservation are incompatible. On the contrary, the objective of considering environmental aspects as a part and parcel of development planning is to achieve:

(i) sustained development with minimal environmental degradation; and

(ii) prevention of long term environmental side effects.

Therefore, environmental conservation and economic development must proceed together and the best way to combat environmental degradation is to adopt the environment friendly technology fostered through proper policies. In view of the primacy of forestry in economic development and environmental conservation and more particularly for countries like India and its neighbour, let us examine the current status of forestry in Asia and the Pacific.

2.8 Current Status of Forestry Resources In Asia and the Pacific

According to an assessment made by FAO in 1990[20], the annual deforestation rate in this region(i.e. Asia and Pacific) increased from 2.0 million hectare during 1976-80 to 3.9 million hectare during 1981-90. However, most of the deforestation have occurred in South and Southeast Asia. Countries in the temperate zone such as People's Republic of China. Japan, and Republic of Korea, on the other hand, have been able to maintain or even increase their forest cover. As regards the cause of deforestation in the tropics it is generally attributed to the horizontal expansion of agricultural frontier in the form of subsistence farming/shifting cultivation, livestock ranching, cultivation of cash crops, colonisation, transmigration and infra structural development programmes. In the humid tropics the major cause has been the unsustainable high harvesting levels which were carried out without sound forest management plans. Logging is considered as a factor of forest degradation that indirectly leads to deforestation. In the dry tropics the major causes are over exploitation for fuel wood, overgrazing and repeated brush fires.

The fundamental forces driving tropical forest loss and deterioration have been identified as: poverty in the rural areas including inequitable land distribution; excessive growth of human and livestock populations beyond the carrying capacity of ecosystems; weak institutional capabilities in forestry administration; the debt burden which has forced governments to look for quick revenues at the expense of sustainable resources management; political instability and war; and lack of adequate education, training, research and extension. The consequences of the depletion of forest resources have been frequent floods, droughts and land slides, soil erosion and siltation, loss of bio diversity, changing climatic patterns, shortage of water, timber, fuel wood and fodder, and extinction of plant ar.d animal species.

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[20] FAO(1990), "Forest Resources Assessment 1990 Project(FRA 1990)"

At the turn of the century India had a forest cover of about 53% of its land area, today hardly 20% land is officially under forest department. But only 10-12% of the area has adequate tree cover. Over one million hectares of forests are cut every year and 0.15 million hectares are lost to development projects annually. Official estimates[21] show that forest cover has increased only by 0.7% since 1977-79, one of the lowest rates in Asia. The official estimate of annual deforestation is about 48,000 hectares(1983-87) as against the annual reforestation of 1,38,000 hectares.

The Table 2.4 compares between India and certain other regions, the land area, the forest area and its percentages, of forest area. The figures show that 30.4% of the total geographical area of the World is under forests.

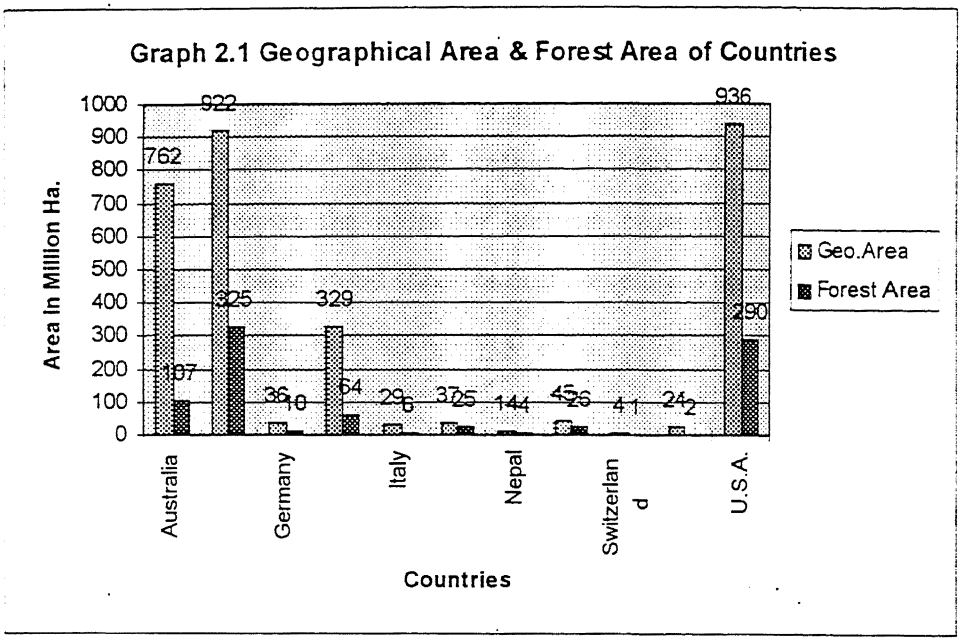
Table 2.4: Forest Area as percentage of Geographical Area of Countries

Country	Geographical Area(in mha)	Forest Area(in mha)	% of Geographical Area
Australia	762	107	14.04
Canada	922	325	34.40
Germany	36	10	36.00
India	329	64	19.40
Italy	29	6	20.69
Japan	37	25	67.60
Nepal	14	4	28.60
Sweden	45	26	57.80
Switzerland	04	1	25.00
U.K.	24	2	8.30
U.S.A.	936	290	41.07
WORLD	13390	4077	30.40

Source: FAO 1985

However, India with 15% of the World population has around 2% of the total forests; Japan, such a small land, has maximum percentage of forest land, this is one of the reason behind its prosperity. The comparison is very clear from the Graph 2.1.

[21] The State of India's Environment, the First, Second and Third Citizens report, Centre for Science and Environment, New Delhi, 1982, 1985 and 1991.



Until recently, it was common policy in countries in the region to have forest lands owned and controlled by the national governments. Forestry authorities had all legal power over the forests. Even where traditional rights of local communities to access forests and communal ownership were respected, private ownership was seldom permitted. However, experts now believe that without looking at the root causes of the problem which are mostly social and economic in nature, no forestry development program will be successful. Accordingly, the importance of integrated forestry management under people's participation is increasingly being recognised. Such management system is viewed as sustainable because forests provide not only materials for industries, but also the life supporting system for the rural population. This basic change in the philosophy or orientation of forestry resources management is being reflected in recent government forestry policies and strategies. It has also enhanced the importance of Social forestry/Community forestry programs in many developing countries.

In this scenario, in order to have an idea of the research going on in forestry management, we would like to analyse few studies undertaken internationally and nationally in the following section.

2.9 Studies Dealing with Forestry Management

Economists have studied Natural Resources from the earliest days of the profession. Resources are seen as the basis for national prosperity, power and wealth. Yet only relatively recently have broad theories been developed specific to natural resources. Only in the last generation have agricultural land, forests, and fisheries been perceived and described as renewable resources. Of course, this does not imply unconditional renewal. Such resources are self-renewing at a limited rate, which may itself depend on the size of the stock in existence at any given time and on the extent and nature of human intervention into the stock dynamics.

In the first reasonably widely known article on the economics of exhaustible resources, L.C. Gray(1914), using the graphical methods characteristic of the time, recognised that a depletable resource was different from an ordinary good in that it is limited in total quantity and is not producible. In 1931 Harold Hotelling applied method of calculus of variation to get the optimal depletion level of natural resources. However, since at that time most economic curricula did not include much mathematical training, Hotelling's approach and results were relatively neglected until recently. Economists revived interest in the matter of optimal depletion theory in the 1960s, and this interest greatly accelerated in the 1970s. Most newer work addresses the 'optimal-path' problem using contemporary mathematical methods.

In the same line of attending optimal path in case of forestry, regulation is being advocated through linear programming technique, the idea being to maximise the output level. Forest regulation is deeply embedded in modern forest management and strongly relate to the concept of sustained yield. The objective of a regulated forest is to assure a continuous yield of the various products and uses of the forest. K.P.Davis's(1966) "Forest Management: Regulation and Valuations" and J.L.Clutter's(1968) "A Computerised Forest Management Planning System" were classic examples of regulation aspect. Also in

1968, there was another work "Forestry and Economic Development" done by Peter Sartorium and Hans Henle in New York. During 1970s World-wide importance was given to environment. In the article "Environmental Preservation, Uncertainty, and Irreversibility", Kenneth J. Arrow and Anthony C. Fisher have discussed the reason behind environmental preservation as it is uncertain and irreversible. In 1971 an inter governmental team was set up to carry out a cost-benefit analysis of British forestry. In this study a wide definition of profitability was taken as the criterion. Following this study, in 1972 the Government revealed its forestry policy in a document in which it was stated that afforestation would continue in Britain as before.

Thomas Andersson and Jan Bojo in their paper "The Economic Value of Forests" have argued that Cost Benefit Analysis(CBA) is a proper framework for this task. In this context CBA should be understood as "a coherent method to identify, quantify and value social advantages(benefits) and disadvantages(costs) in terms of a common monetary unit. The flow of monetary units over time is brought together to a net present value. Unvalued effects(intangibles) are described qualitatively and weighed against valued items. With respect to the relevance of CBA to developing countries with distribution problem many economists have argued that this approach is essentially valid. There is a need to consider income distribution impacts very carefully when looking at an environment such as India's. The valuation should be based on consumers' preferences, their willingness to pay or their willingness to accept compensation. Those preferences should be weighed with certain income distribution weights to express the fact that marginal utility differs very much between income groups. That adjustment can be done on the basis of an evaluation approach which is based on willingness to pay.

The UN WORLD Commission on Environment and Development in its report 'Our Common Future'(The Brundltand Report) stressed the need for a move from a goal of economic growth to one of sustainable development, which it defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. Regarding this sustainable development Ian Bateman, R Kerry

Turner and Seeseana Batemen in their work 'Extending CBA of UK highway proposals: environmental evaluation and equity' have expressed their view that for sustainable development CBA is an important aid to decision-making and environmental valuation is a vital component of any sustainable development strategy.

In 1995 there was one work done by Dean Current, Ernst Lutz and Sara J. Scherr titled "The Costs and Benefits of Agroforestry to Farmers" in which they have taken case studies of twenty-one agro-forestry projects in six central American and two Caribbean countries. A focal point of the analysis was the profitability of agro-forestry for farmers as a crucial incentive to adoption.

In 1995 T Deacon Robert in his paper "Assessing the Relationship between Government Policy and Deforestation" has assessed the effect of public policies on deforestation in a general equilibrium framework. According to the author, a forest can be left in its natural state to provide a consumption benefit, but it is subject to free access. Alternatively, it can be converted to a market input needed to produce a valuable final output.

Recently Anssi Niskanen(1997) has studied the economic profitability of community afforestation programmes in north-east Thailand and the Philippines. Financial and economic profitability were assessed using market prices and economic efficiency values respectively, for goods and factors of production. Environmental- economic profitability was evaluated by adding the monetary values of on-site costs of soil erosion, transpiration, nutrients lost in harvesting and carbon sequestration to the assessed economic profitability estimates. The results showed that economic profitability of afforestation was 40-50% higher than financial profitability, and environmental economic profitability 6-100% higher than economic profitability. Among the studied environmental impacts of afforestation, carbon sequestration and transpiration were most important in economic terms. A decrease in the discount rate improved afforestation profitability.

In the paper "Recreation and Amenity Values of Reforestation" Harrison(1997) has examined that the nature of visual amenity as an economic good, and has reviewed few studies of amenity value. He has expressed his view that though visual amenity is a 'non-market good', the values can be estimated through the demand curve drawn considering the collective willingness-to-pay for enhancing or preserving the quality of visual resources.

In a recent paper in *Nature* R Costanza and colleagues have calculated the value of 17 ecosystem services, including climate, water and gas regulation, nutrient cycling, waste treatment, soil formation, raw materials, genetic resources, erosion control and sediment control. The economic value of ecosystem services for the entire biosphere is estimated to be about $33 trillion. This is a minimum estimate, which will work out to nearly twice the global GNP of $18 trillion.

Following CVM which attempts to quantify the non-marketed environmental goods by considering the public's willingness to pay(WTP), J.Maurice Cohen(1995) has tried to find the effect of the length of the bid vector(set of bid-values) and the spacing of bid-values on the diagnostic tests of incorrect distributional assumptions. The typical "yes-no" responses, along with other information in binary response models(those with two values), are used to trace the distribution of the unobservable WTP values.

Though environment and particularly forests have been under discussion World-wide, in India people became conscious only during 1980s. J.B.Lal's "India's Forest-Myth and Reality" has drawn attention of many people towards forest. Although it was very late for Indians to be conscious of their environment, still recently a good number of works have already been done.

In the paper "Economic Discount and Wage rate for Social Forestry Projects in India: estimates and problems" Sharma and Mc Gregor(1991) examined the procedures which may be applied to estimate the economic discount and wage rates for an economy.

These rates were derived by developing a dynamic production function for social forestry projects in India. The estimated final results for the economic discount and wage rates were 11% and 0.88 market wage rate respectively which were plausible and comparable with other estimates found in the literature.

Another work was done by D.P.S. Verma in 1988 titled "Some Dimensions of Benefits from Community Forestry: A case study regarding the Flow of Benefits from the Dhanori Village Woodlot". The author has evaluated the project taking into account only the tangible benefits. The intangible benefits were not considered. That means a Social Benefit Cost Analysis would have given a better result.

In the article "The Economics of Social Forestry in Orissa" R.A.Sharma(1995) has compared the optimum tree rotation in financial, economic and socio-economic analysis and concluded that the socio-economic optimum tree rotation was generally longer than the financial or economic optima due to the lower discount rate used.

There is another article by the same author R.A.Sharma(1995) "The Land-Use Economy of Orissa with special reference to Forestry". The summary of the paper is that forests have played a vital role in the predominantly agrarian economy of Orissa. The forests of Orissa, which are subjected to heavy biotic pressure, need to be rehabilitated in order to sustain and enhance their contribution to the economy. Social forestry can help reduce the biotic pressure by creating sustainable forest resources.

In 1991 L.K.Patnaik and A.Bhartuar, in their article "Ecological Benefits of Five Year Old Social Forestry Village Woodlots in Orissa", have attempted to evaluate the ecological and environmental benefits of five year old plantation in Social Forestry project villages in Orissa. However, they have discussed the effects of plantations only qualitatively; quantitative assessment would have shown better result.

Another article of R.A.Sharma and S.Skerratt was published in the Indian Forester in September 1995. In that article their remark is that expert systems are found to have a potential role in the socio-economic evaluation of land-use policy, but at the same time they have also opined that those expert systems cannot be seen as replacement for analytical techniques, such as Social Benefit Cost Analysis, but rather as a means of enhancing the analysis in order to provide for better decision making.

J.B.Lal, in his work "Economic Value of India's Forest Stock", has estimated the net present worth of Indian forests. The value of forests as sources of genetic diversity can be viewed as a risk premium- an amount people would be willing to pay to avoid the risk of not having something available which they may want in future. A risk premium can be paid only from savings. He has assumed that to pay this risk premium the nation should be willing to spend at least 10 percent of its savings. Annual gross savings was Rs.66,600 crore and, therefore, Rs.6600 crore is the annual rent earned from forests through the conservation of bio diversity. Again he has assumed that people will spend five percent of the national expenditure on recreation from forests. Thus the value of annual rent earned from forests for various material goods and environmental services are added up. For environmental services he has taken up T.M.Das's study and O.N.Kaul's study(which are discussed later). Having calculated the annual rent from forests, the net present worth of the forest stock is calculated as the capitalised value of property. He has assumed 5 percent as the rate of interest(since forests are subject to many disturbances, both human and natural, hence high rate of interest cannot be used) and calculated the net present worth of Indian forests as Rs.15,91,000 crore.

Environmental services can be valued using the opportunity cost approach or surrogate market techniques. The opportunity cost approach is based on the concept that the cost of using a resource for unpriced or non-market purposes can be estimated by calculating the income that could have been earned if the resource had been put to an alternative use. It is not easy to use surrogate market techniques because many aspects of the environment have no established market price. But it is possible to estimate an implicit

value for an environmental good or service by means of the price paid for another good which is marketed.

T M. Das used surrogate market techniques to evaluate the environmental benefits provided by a medium sized tree which yields a biomass of 50 tonnes over a period of 50 years. According to Das, one tonne of biomass is capable of yielding annual environmental services worth Rs.622 crore(at 1980-81 prices).

In the paper 'Social Forestry As a Tool for Soil Conservation and Wasteland Development' Rath(1991) has expressed his concern for soil conservation through social forestry. It has been categorically mentioned that rich and poor countries alike are menaced by the problem of soil erosion as well as environmental degradation. While in the USA 40 million hectares are damaged beyond any practical repair, in India one-third of arable land is threatened with total loss of top soil due to denundation of forests and vegetation, flooding, water logging, land slides, etc.. An attempt has been made to investigate the problems of environmental degradation in a particular zone of eastern Uttar Pradesh of India and finally the scope of social forestry as a tool for soil conservation and wasteland development has been examined. After a field study in 23 villages of UP it is concluded that there is an urgent need to involve villagers at all stages of project development and for active co-operation and involvement of the people in decentralised management policy and non-formal education must be adopted.

Rohit Shukla in his article 'Social Forestry in Gujarat: Employment and Income', has attempted to find out employment generation of social forestry programme in a particular state. In Gujarat social forestry was started in late 1970s. The concern for social forestry grew out of the increasing shortages of forest products like fuel wood, fodder, and small timber. But as the productivity expanded, it gave rise to numerous expectation. Concern for minor forest products(MFPs), employment, income, and investment came within its purview. Economists became concerned that farm forestry was replacing traditional crops. According to him social forestry has a tremendous potential. A

thoughtful examination of its ramification will convince the people of its significance for development. We can consider a forest as a multi product firm providing MFPs, fuel wood, timber, fodder, and ayurvedic herbs and medicines. Agricultural life in India's rural areas demands large forest area for farm implements, housing and medicines. Social forestry may even lead to a contraction in the labour force, thus forcing children for education.

J.K.Rawat, in his article 'Economic of Farm Forestry in Haryana', finds that over 30,000 hectares. nearly one percent of the States cultivated area, has been devoted to farm forestry during the last seven years, i.e. from 1983 to 1990. The achievements under farm forestry scheme in the social forestry project of Haryana increased rapidly from 2435 hectare in 1982-83 to 8400 hectare in 1985-86. But thereafter the achievement under the scheme fell to less than 3000 hectare per annum because of the crash in eucalyptus prices in certain parts of Haryana.

With regard to the link between forests and other sectors of the economy Mahesh Chander has expressed his view that forest protection and conservation can be pursued by declaring the forest as a reserve so that there is no felling and regeneration, and planting of trees is done regularly on a priority basis. Keeping this in view, a case study was carried out at the IVRI in Mukteswar. This premier institute, located at a height of over 7000 feet in the Kumaon hills, boasts of a rich mixed forest of trees like deodar, cheer, oak, and various other flora of medicinal importance. The institute sells forest products, caters to the fuel and timber requirements of the campus, besides providing an excellent atmosphere for research. This forest, spread over an area of 378 hectares, is a success story from the standpoint of sustainability.

All these studies have attempted to evaluate some or the other aspect of forestry, but till now no comprehensive socio-economic evaluation of forestry has been undertaken in India. The equity and redistribution aspect of forestry schemes, which are considered as national goal of any developing economy are not considered at all. Also there is no

comparative study among different forestry scheme to date. According to Anil Agarwal, "There is an urgent need to develop good cost-benefit analysis technique which includes imputed values for environmental services provided by natural resources like forests, something that is not done at the moment". Kirit Parikh has rightly pointed out that a national programme ought to be launched to develop the tools and techniques needed for such an accounting system. There is a lot in this area that will have to be developed by Indian economists and environmentalists themselves. They cannot rely only on the work being done abroad. For instance, no western resource economist is going to study the social and environmental value of the village commons.

Owing to the growing environmental awareness(i.e. new environmentalism) among the general public, government, and business, in recent years the forestry development schemes have assumed a special significance in our planned development programmes. More particularly, since 1980s development of social forestry on Common Property Resources(CPR) in the rural areas have been focused to meet the fodder and fuel problems and to preserve/regenerate our environment. As those projects generate a large number of benefits and have long gestation periods, generally the investments in this sector are made by the State. But during last few years there is a new awakening in our country with regard to investment in forestry projects. Private investors, industries, farmers, foreign governments, and many NGOs have come forward to invest money in this sector. There are instances where the State is requested to provide some CPR land for undertaking afforestations. With increase in population, availability of land is becoming scarce day by day creating problem for the State in allocation of land to plantation agents. Further, it is noted that few organisations ask for land in the name of plantations, but after acquiring the land they use it for some other purposes. Hence, of late, it is realised that land should be allocated to those agents who use it properly and also to those whose socio-economic efficiency of plantations is high. In such a circumstance it is imperative to evaluate various plantation schemes from the point of view of the society. In view of these debates, we have proposed in this study to undertake empirical investigations of various forms of forestry schemes with the following objectives:

(i) *to examine the scope of different forms of afforestation schemes with the help of few case studies;*

(ii) *to estimate the commercial viability of different schemes through BCA;*

(iii) *to estimate the economic viability of those schemes in terms of SBCA;*

(iv) *to estimate the socio-eco-environmental viability of those schemes in terms of contributions to society as a whole; and*

(v) *to suggest some policy measures for the Government with the help of comparative socio-economic analysis.*

In order to accomplish our objectives, we have chosen the State of Orissa, which enjoys a special status in terms of forest resources in India, as our study area . Thus, it will be appropriate to highlight the role and scope of forestry in India in chapter3 and that of Orissa in chapter 4.

Chapter 3

PROGRAMMES AND POLICIES FOR FORESTRY DEVELOPMENT IN INDIA

3.0 Introduction

The world-wide significance of environment as well as the significance of forestry in economic development of an economy are presented in the last chapter. Since our concern is to analyse the forestry sector of Indian economy by taking into account few case studies from a backward State, in this chapter we propose to discuss the scope of forestry development in terms of the recent environmental movement, the programmes and policies of Government of India along with the constraints faced in achieving the targets. We have also attempted to suggest the possible way-outs.

3.1 Environmental Movement in India

The environmental movement in India, for all purposes, had its beginning during the Fourth Five-Year Plan. In response to the Stockholm Declaration of the U.N. in 1972, the Government of India had laid stress on environmental preservation and protection. In planning and execution of the developmental and industrial projects, the environmental aspects were given due considerations by the Government. Even a popular awareness regarding environmental matters had taken place in our country since 1972. The major environmental issues were spelt out in clear terms. With the creation of institutional arrangements, supported by legislative measures, a number of programmes for environmental management have been implemented in our country during the last few years.

To begin with the environmental issues and objectives, one can observe that our environmental thinking took its queue from the industrially advanced countries and accordingly we perceived our broad objectives as:

- the control of industrial pollution;

- the preservation of the threatened species of both flora and fauna.
  Subsequently, we added two more objectives; viz.,
- to prevent any further degradation and depletion of the country's basic natural resources like forests and life-support systems of land, water, and vegetation;

- to provide all human settlements with at least clean drinking water and a minimum level of sanitation.

It is a matter of gratification that there is a growing realisation in our country that these four-point core environmental issues are vital for our long-run economic development[1]. They deserve emphasis for preservation of our country's production base from natural resources and to combat industrial pollution and insanitation in the interest of public health.

Thus the future of India is closely linked with the restoration of its environment by judicious and efficient management of its natural resources. Forests, which is a major component of natural resources, of India are under heavy biotic pressure due to manifold increase in human and cattle population. The widening gap between demand and supply of forest produce has accelerated the process of deforestation. The consequences are very severe for a tropical country like ours. The maintenance of tree cover is vital both for maintaining ecological balance and for economic sustainability of food production systems. Therefore, the need for improving the productivity of forests and their extension on degraded areas have acquired paramount importance in the national forestry sector today. In such a scenario it is needed to have an idea of the scope of forestry development in India for which knowledge of land use pattern is necessary.

3.2 Scope of Forest Development in India

As the land-utilisation pattern of India shows there is a significant change in its use. The land use pattern for 1950-51 vis-a-vis 1987-88 vis-a-vis 1990-91 in terms of Forests,

[1] Vohra, BB(1987), "The Challenge of Environmental Management in India", Forum of Free Enterprise, Bombay.

Agricultural or cultivated area, Other uncultivated land, Non-agricultural uses, and Barren and unculturable land is exhibited in Table 3.1. The bar chart of the same trend is shown in Graph 3.1.

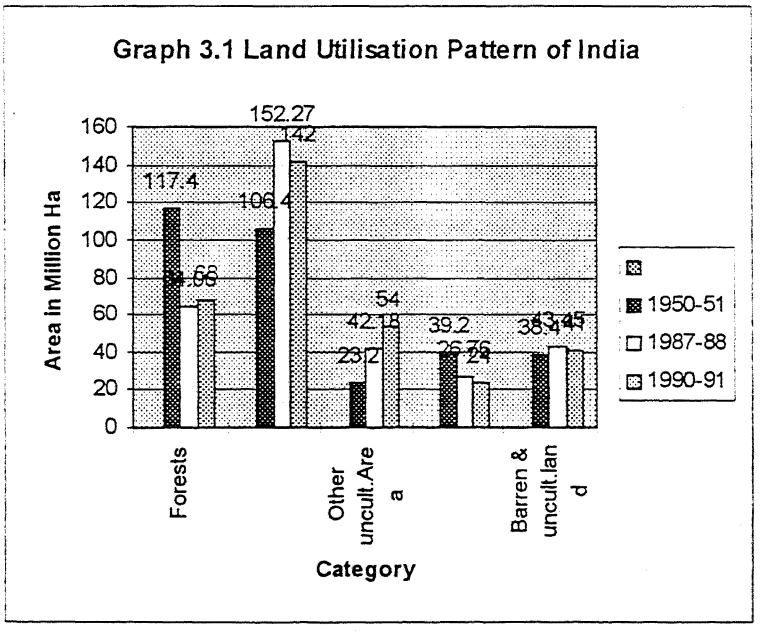
Table 3.1: Comparative Land-Use Pattern of India from 1950-51 to 1990-91

(Area in million hectare)

Category	Area in 1950-51	% of Total	Area in 1987-88	% of Total	Area in 1990-91	% of Total
1.Forests	117.4	36.18	64.06	19.4	68	20.66
2.Agricultural or cultivated area	106.4	32.7	152.27	46.3	142	43.16
3.Other uncultivated land	23.2	7.15	42.18	12.9	54	16.42
4.Non-agricultural uses	39.2	12.08	26.76	8.1	24	7.29
5.Barren and unculturable land	38.4	11.83	43.45	13.3	41	12.47
Total	324.4	100	328.72	100	329	100

Note: The discrepancy of total area is nothing but statistical error.
Source: Five-Year Plans published by Planning Commission, Government of India.

An examination of the figures indicate that while the forest area has declined from 36.18% in 1950-51 to 19.4% in 1987-88, there is a marginal increase in 1990-91 because of our focus on afforestation, soil conservation, and regeneration. On the other hand, the agricultural land had increased from 32.79% to 46.3% due to penetration of cultivation



into forest areas. The population explosion in the country is responsible for such a change. However, in 1990-91 its share had declined. On the other hand, area under uncultivable use category had gone up by more than 5% because of industrialisation, urbanisation, and infrastructure development. Owing to these changes the non-agricultural uses had gone down from 12.08% in 1950-51 to 8.1% in 1987-88 and to 7.29% in 1990-91 . As regards the barren and uncultivable category, the land put to such use had gone up from 38.4 million hectares(mha) to 43.45 mha with a fall to 41 mha by 1990-91. This change is attributed to large scale deforestation, extension of alkalinity and salinity in the command area of large scale irrigation projects and etc. In view of these changes, one may conclude that the scope of development of forests lies through the proper utilisation of these waste land for higher socio-economic as well as environmental benefits.

3.3 Status of Various Forms of Forests in India

In order to ensure proper management the Government has had classified the forests according to their main functions. Mainly the forests are divided into three groups: Reserved Forests, Protected Forests, and Unclassed Forests. Reserved forests are those which have legal sanction under law. They are reserved under enactment to preserve the physical features of the country. Examples of such forests are deep forest covers, ravines, steep slopes of mountains, banks of rivers which without vegetative cover are liable to get eroded and washed away causing floods and damage to habitation and cultivation. Such land cannot be used for any other purposes without the approval of the Ministry of Forests and Environment. Grazing is completely prohibited and those forests are protected against fires and pilfers.

Protected forests are those which are maintained by the State to produce products/ items of economic importance whereby the State earns revenue. They also meet the commercial and industrial requirements for manufacturing of paper, newsprint, etc. In order to cater to the commercial needs they are ought to be managed on scientific lines to derive the maximum value from them. Controlled grazing is allowed in those forests.

The remaining Government forests i.e. Unclassed forests are for meeting the indispensable needs of the local population who more or less live symbiotically with the forests. Every possible efforts should be made to enlarge the area of such forests by afforesting the wasteland and even the marginal agricultural land. State-wise coverage of these forms of forests in 1995 are shown in Table 3.2.

Table 3.2: Forest Area of Different States in India(in sq. km.)

State/Uts	Reserved Forest	Protected Forest	Unclassed Forest	Total Forest Area
Andhra Pradesh	50479	12365	970	63814
Arunachal Pradesh	15321	8	36211	51540
Assam	18242	3934	8532	30708
Bihar	5051	24168	7	29226
Delhi	42	--	--	42
Goa Daman &Diu	165	--	1259	1424
Gujarat	13819	997	4577	19393
Haryana	247	1104	322	1673
Himachal Pradesh	1896	31473	2038	35407
Jammu & Kashmir	20182	--	--	20182
Karnataka	28611	3932	6181	38724
Kerala	11038	183	--	11221
Madhya Pradesh	82700	66678	5119	154497
Maharashtra	48373	9350	6119	63842
Manipur	1463	4171	9520	15154
Meghalaya	981	12	8503	9496
Mizoram	7127	3568	5240	15935
Nagaland	86	507	8036	8629
Orissa	27087	30080	17	57184
Punjab	44	1107	1750	2901
Rajasthan	11585	16837	3278	31700
Sikkim	2261	285	104	2650
Tamilnadu	19486	2528	614	22628
Tripura	3588	509	2196	6293
Uttar Pradesh	36425	1499	13739	51663
West Bengal	7054	3772	1053	11879
A&N Islands	2929	4242	--	7171
Chandigarh	31	--	--	31
Dadra & Nagar Haveli	203	--	--	203
Lakshdweep*	N.A.	--	--	--
Pondicherry*	N.A.	--	--	--
Total	416516	223309	125385	765210

Source: The State of Forest Report, 1995. Forest Survey of India, Ministry of Environment and Forest.

A comparison of the state-wise data reveals that Madhya Pradesh has the maximum reserved forest area(82700 sq.km), followed by Andhra Pradesh in the second position(50479 sq.km), Maharashtra in the third position(48373 sq.km), and Uttar Pradesh in the fourth position(36425 sqkm) and so on. However, in terms of total forest area, the ordering changes; the first position is maintained by Madhya Pradesh, but the second and third positions are taken by Maharashtra and Andhra Pradesh respectively.

Besides increasing forest area with a view to improve the economic and ecologic condition through forest development, Government of India as well as the State Governments had have been attempting to introduce new policies/programmes through various Policies and also through their Five-year Plans.

3.4 Forest Policies and Development Programmes of India

Systematic public management of forests in India is said to have begun with the enactment of the Indian Forest Act in 1865. Even though this act was mainly motivated by the idea of reserving forests for the supply of timber for the British Navy and later for railways and administration in India, it set in process exploration of forest resources, demarcation of existing forests and assessment of growing stocks in productive forests. There was also a recognition that some forests have to be preserved for climatic or other reasons. However, the claims of exploitation were stronger than those of forest preservation and the sole objective of forest administration was public material benefit.

The first forest policy of the country was formulated in 1894. The policy made two major enunciation:

(1) the claims of cultivation are stronger than the claims of forest preservation; and

(2) the public benefit is the sole object of forest administration.

However, the old forest policy indicates that protective and regulative services provided by forests were not fully realised at that point. The British rulers were also reluctant at that stage to limit individual rights over forests for the sake of securing more

protective services from forests. They sought to restrict only those rights which were inconsistent with the material imperial interests.

The Policy also suggested a functional classification of forests into the following four categories:

(a) the preservation forests for climatic or physical grounds;

(b) forests for supplying valuable timber for commercial purposes;

(c) minor forests for producing only inferior wood; and

(d) pasture lands with minimal forests.

However, the forest policy of 1894 suffered from four major weaknesses:

(i) it allowed forests no intrinsic right to space, and in land use subordinated forestry in agriculture;

(ii) it did not give adequate emphasis to protective and regulative services produced by forests;

(iii) meeting people's needs, it did not stipulate the principle of sustained yield; and

(iv) it did not suggest protection of forests from the harmful practices of shifting cultivation and excessive grazing.

Programmes After Independence

The central objective of planning in India, after independence, was to initiate a process of development which would raise living standards and open out to the people new opportunities for a richer and more varied life. The problem of development of an under developed economy is one of utilising more effectively the potential resources available to the community. Realising the over exploitation of forest resources during British period and also during the war period, the Government of India recognised the importance of natural resources; and hence, one of the functions assigned to the Planning Commission of India, from its very beginning in 1950, was to formulate plans for the most effective and balanced utilisation of the country's resources and to make an appraisal, from time to time, of the progress achieved in this direction and then suggest adjustments in policy and

measures to be adopted to hasten the development of the country. As forest planning is a multifaceted, consistent and well-integrated affair, where due weightage has to be given to preservation in the context of soil and water conservation, and then to the satisfaction of the present and the prospective demand of the local people as also that of the industries utilising forest products, accordingly, the successive five year plans have aimed at accelerating the pace of forestry development and the expansion of forestry organisation in the country. In addition to it rehabilitation of the depleted forests of the country was also given special attention in the five-year plans.

The First Five-year Plan gave importance to expansion of basic industries including manufacture of heavy electrical equipment, fertilisers, transport facilities required for industry and mineral development. As far as forestry sector is concerned the plan allocation was Rs.7.64 crore which was 0.39% of the total plan outlay(Rs.1960 crore). It is clearly mentioned in the Plan Document[2] that there is immediate scope for extending the area under forests in three directions, namely—

(i) afforestation as a measure to prevent soil erosion;

(ii) extension of tree lands; and

(iii) establishment of village plantations.

During this period the first National Forest Policy of independent India was formed which is rather known as National Forest Policy 1952.

National Forest Policy, 1952

The weaknesses of the 1894 Policy were adjusted in the new forest policy enacted in 1952. The new Policy recognised the protective functions of forests, and stating that forestry has no intrinsic right to land but may be permitted on the residual land not required for any other purposes, were discarded. The policy suggested that:

> India as whole should aim at maintaining one-third of its total land area under forests. As an insurance against denudation a much larger percentage of the land, about 60 percent, should be kept under forests for their protective functions in the Himalayas, the Deccan and other mountainous

[2] Planning Commission(1950), "The First Five Year Plan", Government of India.

> tracts liable to erosion. In the Plains, where the ground is flat and erosion is normally not a serious factor, the proportion to be attained should be placed at 20 percent; and in view of the pressure of agriculture, efforts at the extension of tree lands should be concentrated on river banks and other convenient places not suitable for agriculture.[3]

On the controversial question of grazing, the policy clearly stated that continuous and cheap grazing should not be allowed in forests, grazing by goats should be totally excluded, and grazing by sheep should be restricted. This policy also set priorities in management by indicating a functional classification of forests as follows:

(a) protection forests for physical and climatic considerations;

(b) national forests for the need of defence, communications, industry and other general purpose of public importance;

(c) village forests for providing firewood, small-size timber and other forest products for local requirements, and grazing ground for cattle; and

(d) tree lands areas which are not under the scope of the ordinary forest management but essential for the amelioration of the national physical conditions.

In the Second Plan(1956-61) most of the schemes of the previous plan were continued. An amount of Rs.21.21 crore was being sanctioned for forestry sector which was 0.46% of the total plan outlay. Some of the important new schemes initiated related to the creation of plantations of economically valuable species, conservation of wild life and preparation of working plans. A number of wild life sanctuaries were established, some degraded forests were rehabilitated and many new forest roads were constructed.

While the first two plan centred around rehabilitation and consolidation of forests, in the third plan a beginning was made to lift forests from purely conservative and biological management to increasing production from them by creating man-made forests of quick-growing and valuable species in place of the existing ones. Special emphasis was laid on measures to meet the long-term requirements and more economic and efficient utilisation of valuable forest products, and to increase the out turn from the existing

[3] National Forest Policy, 1952. Government of India.

depleted forests through better technique of timber extraction, improvement of communication and popularising the use of secondary timbers after proper seasoning and preservative treatment.

In this plan period total plan size was Rs.8576 crore and investment in forestry sector was Rs.45.85 crore which was 0.53% of the total plan outlay. However, full assistance from the Centre was given in order to encourage State Governments to undertake large scale plantations of quick-growing species, mainly to meet the requirements of the paper and pulp industry. As a result an area of about 246,000 hectares were planted with quick growing species. In addition to these a vigorous programme of economic plantations for industrial and commercial uses was pursued. During the period plantations of teak and other broad-leaved species and of conifers were raised on an area of about 394,000 hectares.

A new scheme "Pre-Investment Survey(PIS) of Forest Resources" was undertaken which was implemented in collaboration with the United Nations Special Funds and FAO. This project was designed to investigate by stages the economic availability of surplus forest resources for feeding the wood-based industries. The PIS was the forerunner of the Forest Survey of India of today.

Another project was implemented which was related to the establishment of "Logging Training Centres" also with the assistance of the U.N. Special Funds. The object was to train forest officers and field executives of State Government and of forest lessees and contractors in basic logging cable ways, planning and efficiency studies etc., with a view to obtain higher timber yields from forests by minimising wastage. During the period, training was given in to 827 forest officers at four training centres. The third plan also laid stress on the development of village and extension forestry. However, the progress made in this regard was very inadequate.

While adhering to the objectives and principles of the Third plan, greater emphasis was placed on increased plantation activities and intensive management of forests to attain self-sufficiency in the Fourth plan(1966-69). The basic considerations and the guiding principles were:

(i) Adequate forest cover to prevent floods, conserve soil and moisture, protect water reservoirs;

(ii) Adequate supplies of forest raw materials for wood-based industries and of construction timber for which there was a growing demand;

(iii) Adequate supplies of fuel wood; and

(iv) Preserving natural environs for scenic beauty, sport, recreation and scientific study.

Based on these considerations the specific obligations considered were: scientific management of hitherto unorganised forests; stricter protective measures against pilfering, excessive grazing, fires, encroachments etc.; formation of manageable units and appointment of adequate staff; replacement of slow-growing and less valuable species by those which are quick growing and valuable; afforestation of barren lands; introduction of improved methods of harvesting; extension of communication; better housing facilities for the staff; wildlife and nature conservation; intensive research and training; provision of statistical cells, etc.

The Fifth plan(1974-79) introduced an important element of change in the country's strategy in forestry; conservation-oriented forestry was to give way to dynamic progress of production forestry, to increased production of industrial wood and other forest products of economic importance. Extensive man-made forests were created, with institutional financing, to feed the existing and prospected industries utilising forest products. Greater attention was given to plantation on land along roads, canal banks, railway lines and flood embankments, and mixed plantation for commercial use also received attention. During this period the National Commission on Agriculture(NCA) was set up and it gave its report in 1976. The Commission's recommendation was for 'social forestry', i.e., raising plants and trees for supply of firewood, fodder and small timber for

the community. The basic philosophy behind this programme centred round the imperative need for creating sustainable forest resources in order to meet the villager's needs for fuel wood, fodder and small timber. The objectives of this programmes were:

- to increase green coverage;
- to produce and supply fire woods, small timber, and minor forest produce to the rural population, specially to the land less and other weaker sections;
- to produce raw materials for paper, rayon and match industries
- to create more employment in rural areas through afforestation.

In addition to this the forestry matter was transferred from State to the Central Government. The Commission sought to resolve the problem of multiple roles of forests by reclassifying forest areas purpose wise as follows: (a) protection forests, (b) production forests, and (c) social forests.

> Forests managed primarily for protection occupy hill slopes, watershed of rivers, river banks, sea shores and other localities vulnerable to erosion and degradation.....Production forests which are commercial forests, should comprise valuable or potentially valuable timber bearing stands occurring in favourable regions which are indispensable for development of the country and for meeting diverse requirements of the national economy.....The social forests should cover wastelands, panchayat lands, village common lands on the side of the roads, canal banks and railway lines, which may be brought under forest plantations, shelter belts and mixed forestry comprising raising of grass and leaf fodder, fruit trees and fuel wood trees.[4]

The Sixth Five-Year Plan(1980-85) continued the momentum gathered during the previous plan period. However the thrust was on social and community forestry and development without destruction. The outlay on forestry sector during this plan period was Rs.692.49 crores which was 40% more than what was spent in previous 30 years, but in percentage term the sixth plan outlay for forestry was less than 0.71% of the total plan outlay. The following broad strategies were adopted:

[4] Government of India, Report of the National Commission on Agriculture,1976.

(i) The environment was improved by producing man made forests and undertaking massive afforestation on degraded lands;

(ii) Strict protection was afforded to wild life and its habitat;

(iii) A massive social and farm forestry and village fuel wood plantation programme was taken up to meet the ever growing energy needs of the rural people;

(iv) Employment was provided to the ever increasing rural population with special attention to the weaker sections of the society; and

(v) The following four programmes of thrust were introduced during this plan period-

(a) Tree for every child programme

This programme was proposed to envisage the promotion of school forestry programmes based upon the interest of the children themselves with reference to the choice of trees. Under this project assistance including training and supply of relevant seedlings were to be provided to all the schools which were willing to join a programme of enabling children studying in the school to plant and protect one or more trees at their homes.

(b) Eco-Development force of ex-servicemen

An Eco-Development Force consisting predominantly of ex-servicemen were to be formed for the purpose of restoring damaged hill eco-systems through afforestation and soil conservation.

(c) Eco-Development camps for students

College students drawn from different universities of India were supposed to take up extensive tree planting work in suitable areas, such as hills, desert and coastal regions.

(d) Agro-Forestry programme

Under this head Forestry Departments and the Indian Council of Agricultural Research were to undertake jointly agro-forestry research in order to develop suitable systems of land management which involved integration of silvi-culture with horticulture, agriculture, animal husbandry etc.

It was hoped that the above programmes together with the extensive tree planting work would help not only to arrest the further degradation of forests but also to build the ecological infrastructure necessary for sustained development.

In 1980 the Forest Conservation Act was enacted, under which any kind of conversion of forest land to non-forest uses without prior approval of the Government of India was prohibited. Further, the Ministry of Environment and Forests was created in 1984 to focus attention on forests and environment. The specific objectives of this Ministry were:

- to prepare environmental law and policy,
- pollution monitoring and control,
- survey and conservation of natural resources,
- management of forests and conservation of wild life,
- promotion of research,
- environmental education, awareness and information, and
- inter national co-operation.

As we have already pointed out that the scope of development of forest in India is through the utilisation of waste land, in order to utilise those waste land National Wasteland Development Board was set up in 1985 under the Ministry of Environment and Forests. On January 5, 1985 the then Prime Minister Rajiv Gandhi announced, "Continuing deforestation has brought us face to face with a major ecological and socio-economic crisis. The trend must be halted. I propose to set up a National Wasteland Development Board with the object of bringing five million hectares of land every year under fuel wood and fodder plantations. We shall develop a people's movement for afforestation."

This declaration resulted in a transformation and reorientation of policies with a new emphasis on wasteland development. The National Wasteland Development Board(NWDB) started functioning from the beginning of the Seventh Plan(1985-90). The experience gained in implementing the programme of the NWDB was quite valuable and made everyone realise that the problem of wastelands cannot be tackled by tree planting alone. A broad based and multi disciplinary approach is needed to deal with the serious challenge of land degradation and deforestation. Accordingly, it was decided in Oct 1989 to upgrade the wastelands development programmes to the level of a Technology Mission. The overall goals of the National Mission on Wasteland Development are:

- to check land degradation;
- to put wastelands to sustainable use;
- to increase biomass availability of fuel wood and fodder in particular, and restore ecological balance;
- people's participation, especially through panchayats.

The Mission has proposed to tackle a total target of 17 million hectare during the Eighth plan(1990-95). Thus it is obvious that actions are being undertaken in order to increase the forest area of India.

As regards the production forestry programme emphasis was laid on the conversion of low-value mixed forest areas into high-value mixed plantation of commercially important species like teak and bamboo. It is noteworthy that social forestry and production forestry programme put together had created plantations over an area of 2.25 million hectares during the Sixth plan period, as against 3.55 million hectares during all the earlier five-year plans together. The PIS, created during third plan, was being reformed as Forest Survey of India(FSI) after the recommendation of the NCA. The main activities envisaged for FSI were forest inventory and re-inventory, photo interpretation and mapping, data processing and training, consultancy etc.

Further, the Planning Commission through its Seventh plan(1985-90) gave importance to the protection of the eco-system for the economic development of the country. During this plan the allocation for forestry and wild life was raised substantially to Rs.1825 crores which is 1.01% of the total plan outlay. The main objectives, approaches and strategies during this plan were:

(i) Conservation of ecologically fragile eco-systems and preservation of biological diversity in terms of fauna and flora;

(ii) Increasing substantially the vegetative cover by massive afforestation through social forestry, farm forestry and other plantation programmes;

(iii) Meeting the basic needs of the people in respect of fuel wood, fodder, minor forest produce and small timber;

(iv) Ensuring close linkages between Forestry programmes and welfare of the tribal and other communities traditionally dependent upon forests;

(v) Special emphasis on forestry research, education, training and extension;

(vi) Implementing the national wild life action plan for wild life conservation, and

(vii) Creating a massive people's movement for achieving the above objectives.

However, in spite of the forest policy 1952, conservation act 1980 etc. degradation and diversion of forest lands to other uses continued. As many as 4.328 million hectares(mha) of land were diverted to non-forest use between 1951 and 1980. Interpretations of Land sat imagery in the early 1980s led to the realisation that the actual forest cover(of sufficient density for environmental stability) was only about 64 mha. This led to the latest forest policy resolution of 1988.

National Forest Policy, 1988

This policy proclaims that the principal aim of forest policy must be to ensure environmental stability. The derivation of direct economic benefit must be subordinated to this principal aim. The policy, for the first time, recognised that the needs of people living in areas adjoining forest areas for fuel wood, fodder and other minor forest products must be taken care of to prevent depletion of forests beyond the sustainable limit. Increasing the forest and tree cover through massive afforestation, especially on denuded, degraded and

unproductive lands, is a basic objective of the 1988 policy. The salient features of the policy are:

- maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of the forests of the country;
- conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country;
- checking soil erosion and denudation in the interest of soil and water conservation for mitigating floods and droughts and for the retardation of siltation of reservoirs;
- checking the extension of sand-dunes in the desert areas of Rajasthan and along the coastal tracts;
- increasing substantially the forest/tree cover in the country through massive afforestation and social forestry programmes specially on all denuded, degraded and unproductive lands;
- the requirements of fuel wood, fodder, minor forest produce and small timber of the rural and tribal populations;
- encouraging efficient utilisation of forest produce and maximising substitution of wood;
- creating a massive people's movement with the involvement of women, for achieving these objectives and to minimise pressure on existing forests.

The Eighth plan started in 1992 and the objectives in this plan were to increase afforestation programmes, preserve the eco-system and wild life and strengthen forestry research, education and training. It was clearly mentioned that forest conservation and development must aim at preservation of biological and genetic diversity in terms of flora and fauna and protection of forest cover from further degradation. At the same time meaningful projects are to be developed to utilise wastelands and to make them productive. The allocation for forestry sector in this plan period was Rs.4081.87 crores which was 0.94% of the total plan outlay. Although in absolute terms there has been an increase in plan outlay on forestry, but in relative terms it was more or less insignificant.

Experts feel that this allocation has been insufficient for forest development. This explains to a considerable extent, as to why the contribution of forestry to GDP has been so low.

3.5 Review of the Policies and Programmes

We have already discussed the plans and policies of the Government for increasing green coverage as well as to have better quality of tree lands in India, both before and after independence. In spite of all these policies between 1951 and 1972 alone, India was supposed to have lost 34,02,000 hectares of forest land(Table 3.3). Out of this over 70% of forest area was lost to agriculture and another 17% was lost to river valley projects, industries, and roads and communications.

Table 3.3: Forest Area Lost Between 1951 and 1972

(Area in thousand hectare)

Purpose	Area
River valley projects	401
Agricultural purposes	2433
Road and communications	55
Establishment of Industries	125
Miscellaneous	388
Total	**3402**

Source: Forest Resources of Tropical Asia. FAO. 1981.

Further, it is so depressing to point out that the rate of deforestation is higher than the rate of afforestation. The Forest Survey of India has been conducting survey from time to time and its report confirms that compared to 1993 the total area of forests has declined by 507 sq. km. in 1995. The Table 3.4 shows that, the forest area has increased in 10 States/UTs, it has remained constant in 3 States/UTs and for the rest of the States/UTs i.e. for 16 States/UTs it has declined.

An evaluation carried out by the Programme Evaluation Organisation(PEO) of the Planning Commission had indicated that people's participation under the afforestation programmes had been very limited and the trees planted were of species which met the requirement of wood for urban markets rather than the subsistence needs of fuel and

fodder of the rural poor. Moreover, under the social forestry programme, the efforts had largely

Table 3.4: Comparative Situation of Forest Cover in 1993 and 1995

(in sq. km)

State/Uts	1995 Assessment	1993 Assessment	Changes in 1995
Andhra Pradesh	47112	47256	-144
Arunachal Pradesh	68621	68661	-40
Assam	24061	24508	-447
Bihar	26561	26587	-26
Delhi	26	22	+4
Goa Daman &Diu	1250	1250	no change
Gujarat	12320	12044	+276
Haryana	603	513	+90
Himachal Pradesh	12501	12502	-1
Jammu & Kashmir	20433	20443	-10
Karnataka	32382	32343	+39
Kerala	10336	10336	no change
Madhya Pradesh	135164	135396	-232
Maharashtra	43843	43859	-16
Manipur	17558	17621	-63
Meghalaya	15714	15769	-55
Mizoram	18576	18697	-121
Nagaland	14291	14348	-57
Orissa	47107	47145	-38
Punjab	1342	1343	-1
Rajasthan	13280	13099	+181
Sikkim	3127	3119	+8
Tamilnadu	17766	17726	+40
Tripura	5538	5538	no change
Uttar Pradesh	33986	33961	+25
West Bengal	8276	8186	+90
A&N Islands	7615	7624	-9
Chandigarh	7	5	+2
Dadra & Nagar Haveli	204	206	-2
Lakshdweep*	---	--	--
Pondicherry*	---	---	--
Total	639600	640107	-507

* No discernible forest cover.

Source: The State of Forest Report, 1995, Forest Survey of India, Ministry of Environment and Forests.

been departmental. The rural poor and tribal, who depend mostly on public and forest lands for their living, had at best, been given restricted access to the areas taken up for development.

There were few studies which proved that social forestry programme was a disaster in India. For example: IYR Krishna Rao[5](1988) had expressed his concern against social forestry that it had done a lot of damage in terms of displacing food crops and agricultural labour. He had shown that encouragement of social forestry by the Government was at the cost of food grain production and consequential displacement of labour employment in growing such food grain crops. The area which came under social forestry were being used before for food crops. However, in the same study he had mentioned that social forestry had more employment potential if it raised in waste, barren or marginal lands, but not on lands where crops were grown. Thus he had concluded that the Forest Department should be given responsibility of raising social forestry on barren, waste land where no other crop can be raised. Further, Chandrashekhar et al[6](1987) had also criticised vehemently the social forestry programme where eucalyptus were being planted in farm lands. Taking case studies from Karnataka they had objected that social forestry in Karnataka was being implemented not for the demand of poor but for the demand of industries. Their view was also to have social forestry in wasteland where no other crops can be grown.

In contrast to the above arguments, Patel[7](1987), as a farmer of social forestry in Gujarat, had expressed his view point. Though he started with eucalyptus, eventually he had switched over to mixed varieties such as eucalyptus, subabol, bamboo, teak, neem, lemon, mango, chiku and ber. This model had given him high income. The criticism which was given against eucalyptus that instead of meeting fuel wood demand, it had been meeting industry demand, was strongly objected by him. As 30% of biomass of eucalyptus is firewood, by growing it we are producing enough fire wood. Half of this fire wood consists of twigs, leaves, etc. which form the unsaleable part of firewood which remains in

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[5] Rao.Krishna Rao(1988), "Social Costs of Social Forestry", Economic and Political Weekly, Vol.23. Dec 10, pp.2629-2630.

[6] Chandrashekhar, D.M. et al(1987), "Social Forestry in Karnataka:An Impact Analysis", Economic and Political Weekly, Vol.22, No.24, Jan 13.

[7] Patel VJ(1987), "Social Forestry:A Farmer's Viewpoint", Economic and Political Weekly, Vol. 22. Aug.18, pp1365-1366.

the rural areas as free firewood. Thus all these studies pointed out one thing: social forestry plantations should be raised on barren, waste lands; the trees should be of mixed variety including fruits, and fire wood and other species.

Further the National Forest Policy, 1988, was not supported by any legislation and was open to interpretation in any way by State Governments. As a result, India's fabled bio diversity was under serious threat, with many species having vanished forever or teetering on the brink of extinction, like the tiger. If animal and plant life is under siege, so are millions of people in their prime. The adverse effects of air pollution may cause 2.5 million premature deaths in 1997 alone. The air quality in 20 cities had been rendered dangerous as a result of unchecked vehicular and industrial pollution. Contrary to popular opinion, air pollution was not primarily an urban phenomenon. Recent studies show that 74% of the rural population bears 84% of the exposure burden. There are numerous cost effective methods available to minimise the damage, but predictably none has been implemented. This apathy has extended to water pollution as well- India's water bodies receive enormous quantities of waste, leading to dangerous level of water related disease and death. The hyped of "green" drives which take place periodically have never gone beyond providing photo-opportunities for politicians. All this under scores the urgency of effecting departures from the past ruinous pattern of development. The summary outlines three specific areas which if ignored could create conditions for irreversible damage to the environment. The first is to develop a mindset which views conservation as making the difference between life and death. Another would be to check migration to decaying cities where civic amenities no longer exists. And finally, clean technologies must be adopted to check the poisoning of our environment. The last 50 years have been particularly bleak, but it is not too late to place measures to usher in a more sustainable model of development for the next century.(The Times of India, Aug 9, 1997)

Recently two World Bank staffers, C.Brandon and K Hommann have estimated that environmental damage in India amounts to $9.7 billion(about Rs.34,000 crore) each year.

The estimates have taken into consideration the health costs incurred from burgeoning pollution and the loss in production costs due to natural resource degradation. The point that comes through quite clearly is that India has one of the most degraded environments in the World. The real choice is therefore never one between growth and the environment. It is a choice between long-term and sustainable economic gains derived by taking care of the environment and short term growth from its neglect.(The Times of India, May14, 1998)

3.6 Constraints of Forestry Development in India

The discussion on forest policies shows that all of these have been well documented and incorporated the concepts like sustainability, poverty alleviation, equity, participatory management, etc. However, despite these laudable concepts, why is it that the resource continues to replenish, plantation failure is recurrent, watersheds remain eroded and bio diversity is threatened with extinction? Obviously, this is because forest policies and programs have continued to remain ineffective not only in India but the developing countries as a whole. Or else, how does one explain the fact that primitive man who was once a gatherer of food and hunter of meat has gone through a transition centuries back to be a producer of food and crops(agriculture) and animal meat(animal husbandry) but he continues to be a gatherer of fuel-wood and other non-wood forest products(NWFPs), particularly when cultivating trees is so intrinsic to our society and has been amply demonstrated long ago, when people started to cultivate fruit trees.

It is also recognised that forest policies and programmes alone cannot secure the wise use of the forests and its development. Success of the forest policies requires the harmonisation of other sectoral policies and programmes that influence forest policies. These include:

- population policies;
- land tenure policies;
- policies aimed at raising agricultural productivity thereby reducing need for new land;

- animal husbandry and livestock policies; and
- pricing policies etc.

The greatest deficiency of our approach to forest development has been the lack of economic reckoning. On the plea of being a poor country, we have been investing much less on forest lands than what is required even to keep them in good repair. A positive net revenue is no consolation, when the opportunity cost of land is not taken into account.

It is a matter of concern that there is a negative growth rate of contribution of forestry sector to the Gross Domestic Product of India. While the contribution in 1950-51 was Rs.2590 crores(1980-81 prices), in 1970-71 it was Rs.3580 crores and in 1990-91 it was around Rs.2950 crores. Hence keeping this in view proper action should be taken. Another point is the need to improve productivity. The productivity of Indian forests which is tentatively estimated as low as 0.53 cubic metres(cum) per hectare per annum compared to the World average of 2 cum per hectare could be put up by proper conversion of forests, and by reducing rotations. Again, there is a great need to utilise all the species available in Indian forests rather than a few well known ones. Vast amounts of wood are wasted in Indian forests for lack of efficient logging methods. This should be stopped without delay.

In addition to these measures one more thing can be added that to bring success to any plantation programme, particularly social forestry programmes; people's participation in formulating and implementing the schemes based on local needs should be taken seriously. In this line Blair(1986)[8] had expressed his concern that social forestry which was intended to bring benefits to marginal farmers and the land less labourers, in fact, resulted in putting additional income into the pockets of the rural rich. Hence efforts should be made to solicit people's participation in formulating and implementing the schemes based on local needs, potential and availability of inputs.

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[8] Blair. HW(1986), "Social Forestry: Time to Modify Goals", Economic and Political Weekly, Vol.21, No.30, July26.

3.7 Possible Way-Outs

Notwithstanding all these constraints, still there are way-outs to come over the grip. The very first thing that the situation demands is that all further illegal and unauthorised felling should be stopped at all costs. Secondly, the denuded lands must be effectively protected against the ravages of grazing and browsing animals, so that regeneration can take place. Experience has shown that in all fenced-off areas, a great deal of natural growth of grasses, shrubs and trees takes place-through seeds already in the soil or borne by the wind or carried through bird and animal droppings- if only animals are not allowed to eat them up or trample them under foot while they are still tender.

The third initiative which needs to be taken is to launch a country-wide campaign to minimise both soil and run-off losses by carrying out, on as extensive a scale as possible, works like contour trenching, contour bunding and terracing and the construction of numberless small storages, ideally one in every mini catchment-so that there may be enough moisture in the soil to support natural regeneration.

To sum up, the challenges of environmental management in India are so colossal in nature, as compared with the resources available for meeting them, that we have no choice but to be highly selective and ruthlessly practical in approaching them. In the situation in which we are placed today, we must give the top most priority to the most efficient programmes which can be gauged through projectisation only. Since funds are scarce, allocation of resources can be done to the most efficient and socially viable programmes. The main goal of planning process is the allocation of resources according to some form of conflict resolution between value holding groups in society. Given the presence of market and policy failures, it must be expected that ordinary financial market signals fail to secure economically efficient solutions. To enhance rational decision making regarding forestry resources, it is necessary to organise information so as to adequately incorporate environmental externalities as well as other distortions. To accomplish this task, Social Benefit Cost Analysis(SBCA) is the proper framework. The SBCA, in this context, be

understood as a coherent method to identify, quantify and value social advantages(benefits) and disadvantages(costs) in terms of a common monetary unit. In view of these advantages of SBCA, to achieve our objectives, we have resorted to the tool of SBCA in evaluating few forestry schemes of Orissa.

Chapter 4

GROWTH PATTERNS OF FORESTS AND FORESTRY IN ORISSA

4.0 Introduction

In the World of growing environmentalism and environmental movements, we have already specified our objectives in terms of undertaking evaluation of few forestry schemes in a backward State, viz., Orissa. which is located in the eastern part of India. The State lies along the north-eastern sea board of the Indian peninsula with an extensive hinterland far towards the west. The States of West Bengal, Bihar, Madhya Pradesh and Andhra Pradesh lie on its north, north-west and south-west sides respectively and the blue water of the Bay of Bengal washes its eastern face. For Orissa economy, which has nearly one-fourth of tribal population who are dependent on forests and forest resources, forests had have played a major role for promoting its economic development.

The prime reason behind the choice of this State for our study is that it is heavily wooded(38.4%) than many other States in India. Further, the per capita forests in Orissa(0.23 ha) is more than double the national average(0.11 ha). However, there is a great disparity between the per capita incomes of Orissa and India which is increasing over the years. Agriculture provides employment for 79% of Orissa's working population and accounts for 69% of the State's domestic product. In such a less developed and agrarian economy the forests of Orissa are playing an important role not only in generating its GNP and non-tax revenue for the Government but also in meeting the basic consumption needs of the rural population. Hence our objective in this chapter has been to examine the scope of forest development in Orissa, its growth patterns, outlays and expenditure in the forestry sector in the planning era, and the various schemes and agents involved in the schemes of afforestation. But before discussing those aspects one should have an idea about the socio-economic profile of the State.

4.1 The Socio-Economic Profile of Orissa

Orissa constitutes 4.74% of the land mass with 3.74% of population and 7.4% of forest coverage of India. It has a long coastline of 480 km.. with rich marine wealth. The

population of Orissa which was 263.70 lakh in 1981 had increased to 316.60 lakh in 1991. The decennial growth rate of population of Orissa during 1981-91 was 20.06% as against 20.17% in the previous decade. The sex-ratio in the State, i.e. females per 1000 males, witnessed a decline from 981 in 1981 to 971 in 1991 compared to all India fall from 933 to 927 during the same period. The density of population which was 169 persons per sq. km. in 1981 had increased to 203 in 1991 and the urban population has increased from 11.8% in 1981 to 13.38% in 1991. In the literacy front, the achievement had been significant as the literacy rate rose from 34.2% in 1981 to 49.1% in 1991. The male and female literacy rates which were 47.1% and 21.1% respectively in 1981 had increased to 63.1% and 34.7% in 1991. The scheduled caste and scheduled tribe population constitute 16.20% and 22.21% of the State population respectively. The area inhabited by SCs/STs cover nearly 45% of the total geographical area.

According to 1991 census, the total labour force of the State was 118.83 lakh constituting 37.53% of the total population of the State. Out of the total workers, the main workers comprised of cultivators accounted for 44.31%, agricultural labourers 28.68%, household workers 3.13% and other workers 23.88%. As prospects of alternative sources of livelihood are limited in the rural areas, the pressure of population on land is considerably high. Nearly 63.75% of the total working population are engaged directly or indirectly in agricultural activities. For such an agriculture dominated economy with rich natural resources planned exploitation and optimum utilisation of those resources holds the key to rapid economic development of the State. Since our concern mainly revolves round the forests, in the next section we would like to discuss the forests of Orissa.

4.2 The Forests of Orissa

The land utilisation pattern of the State provided in Table 4.1 shows that forest and the area under miscellaneous trees and groves constitute the highest proportion of land area of the State. An examination of the figures in Table 4.1 further depicts that compared to 1975-76, there had been a decline in the forest area(i.e. from 40.92% to 35.26%), current

fallows(from 3.57% to 0.76%) and other fallows(1.44% to 1.38%) in 1990-91. However, for all other groups the area had increased. Further, when we add area under culturable

Table 4.1: Comparative Land - Use Pattern of Orissa From 1975-76 to 1990-91

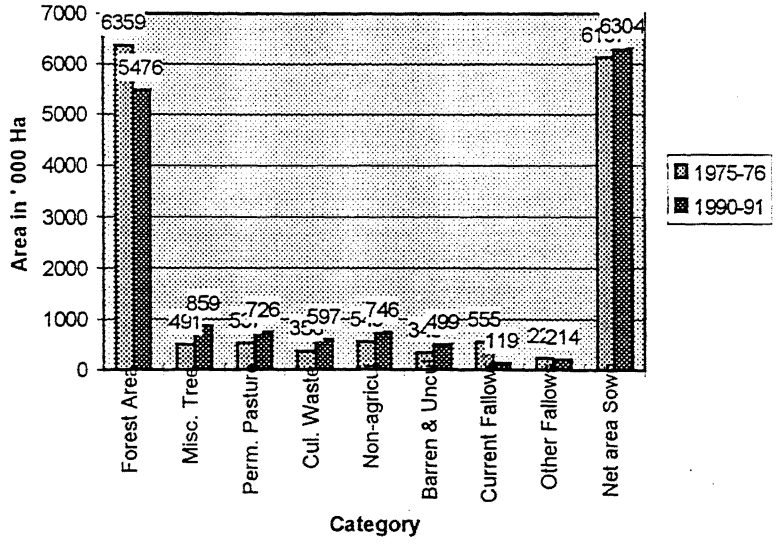
(Area in '000 ha.)

Category	1975-76	1990-91
Forest Area	6359(40.92%)	5467 (35.26%)
Misce. Tree Crops & Groves	491(3.15%)	859 (5.54%)
Permanent pastures & other grazing lands	537(3.45%)	726 (4.68%)
Culturable wastes	356(2.29%)	597 (3.85%)
Land put to non-agriculture	540(3.47%)	746 (4.81%)
Barren & Unculturable Land	340(2.18%)	499 (3.21%)
Current Fallows	555(3.57%)	119 (0.76%)
Other Fallows	225(1.44%)	214 (1.38%)
Net Area Sown	6137(39.49%)	6304 (40.66%)
Total Geographical Area	15540(100)	15540 (100)

Source: Government of Orissa

wastes, barren and unculturable land, current fallows and other fallows we found that 9.77% of the total geographical land are either unutilised or under utilised in 1990-91.

Graph 4.1 Land Utilisation Pattern of Orissa



For administrative and management purposes, the forest of Orissa are also divided into reserved forest and protected forests. Again protected forests are of two types, i.e. demarcated and un-demarcated. As per the Forest Department records(1991-92) the total forest area consists of 47% reserve forests, 28% demarcated forests and 25% un-

demarcated forests. Reserved forests are under the control of forest Department of Government of Orissa. Prior to enactment of Forest Conservation Act, the Revenue Department was having control over the land in un-demarcated forest and Forest Department was having control over the tree cover. But after the Forest Conservation Act 1980 came into being, not only Forest Department is having control over the land and tree

Table 4.2:Division-Wise Forest Area of Orissa

(Area in sq. km)

Circle	Division	R.F.	D.P.F.	U.D.P.F.	U.C.F.	Total
Angul	Angul	907.88	211.06	816.30	0.76	1936.00
	Athamalik	527.36	-----	629.76	0.42	1157.54
	Athagarh	428.00	250.37	336.59	0.45	1015.41
	Dhenkanal	1140.97	47.60	582.57	0.04	1860.13
	Karanjia	379.61	186.72	145.66	0.27	738.45
	Keonjhar	1833.02	648.41	12.68	0.24	2494.35
	Baripada	383.92	118.54	75.84	0.53	1127.43
Berhampur	Boudh	1015.14	42.68	57.94	1.02	1116.78
	Gh.North	909.69	8.14	------	0.53	918.36
	Gh.South	530.23	517.62	697.74	0.30	1745.89
	Nayagarh	1098.37	385.28	310.45	0.08	1794.18
	Paralekhemundi.	446.12	2053.18	1869.17	0.16	4368.63
	Phulbani	980.54	658.51	124.84	1.40	1765.29
	Puri	433.30	191.01	698.51	1.38	1324.20
	Baliguda	1029.52	1173.94	564.98	0.59	2769.03
Koraput	Bolangir	1203.37	30.50	-------	0.16	1234.03
	Jeypore	480.36	855.83	754.67	0.53	2091.39
	Kalahandi	1448.83	864.33	1537.22	0.54	3850.22
	Khariar	22.40	2135.83	264.87	0.51	2423.61
	Nawarangpur	584.08	1152.36	19.11	0.12	1755.67
	Rayagada	1079.72	2273.47	1666.36	0.18	5019.73
Sambalpur	Rairakhol	1068.87	126.66	574.30	0.51	1770.34
	Sundergarh	1489.75	470.88	194.10	1.01	2155.74
	Deogarh	902.66	234.77	219.16	0.03	1356.62
	Bamra	722.91	380.50	426.97	0.95	1531.38
	Bonai	1162.64	432.44	237.54	0.71	1833.33
	Sambalpur	1070.45	51.06	227.35	0.28	1513.86
TOTAL		23279.71	15501.69	13044.68	13.7	51839.78

Note: R.F.-Reserved Forest; D.P.F.-Degraded Protected Forest; U.D.P.F.-Undegraded Protected Forest; U.C.F.-Unclassified Forest
Source: The Office of the PCCF Orissa, 1991, Bhubaneswar.

growth over un-demarcated protected forest, but is having control over any type of forest land recorded in the land records. The area of reserved forest, degraded forest,

undegraded forest, and unclassified forest in different division of the four circles are shown in the above Table 4.2.

In 1972 there were 67,461 sq. km of forests area which comprised of 24,166 sq. km of reserved forests, 561 sq. km of demarcated protected forests, 20,023 sq. km undemarcated protected forests and 12 sq. km unclassed forests. Besides these varieties, three other category of forests were also there:6,150 sq. km of land demarcated for reservation, 139 sq. km for *lakhraj* forests and 16,354 sq. km for ex-*zamindar* forests. Compared to these figures, in 1991, the total forest area had declined to 51,840 sq. km(shown in Table 4.2) where there are 23.280 sq. km of reserved forest, 15,502 sq. km undegraded protected forests and 13.7 sq. km unclassified forests.

The above analysis depicts that the forest cover in Orissa is shrinking rapidly mainly due to heavy biotic pressure. Nearly 1,34,000 ha. of forests had been cleared during 1951 to 1983 owing to extension of cultivation for agriculture and also because of extension of irrigation, power and industrial projects. Furthermore, there has been pressure from large number of cottage and village industries which depend on forests for raw materials either indirectly or directly. In addition to all these, nearly 90% of the total tribal population(who are mainly forest dwellers) in Orissa depend on agriculture for earning their livelihood, often practising shifting cultivation. Around 5,298 sq. km of forest land have been used for shifting cultivation annually. In this scenario it is imperative to examine the management structure of forests in Orissa.

4.3 The Management Structure of Forest in Orissa

The rural communities in Orissa had have been using forests groves and pastures from time immemorial to fulfil their basic consumption needs. However, restrictions were gradually imposed on the villagers' use of forests by the Government mainly to earn revenue and protect commercial interests. Although village forests and pastures were owned by communities, they suffered heavily due to their overuse and lack of any management. After independence all private forests under the control of rulers and

zamindars were brought under the control of the Forest Department for their management under the provisions of the Indian Forest Act, 1927, but at many places the village forests and endowment forests remained under the control of villages and revenue department respectively.

Typically Orissa had pioneered in the development of CPRs such as village forests and pastures. All forests other than reserved forests were included within the village boundaries under the provisions of the Orissa Survey Land Settlement Rules, 1962 and at least 10% of the effective village area was reserved as village forests and pastures for exercising rights and privileges of the local communities.

The private rights were created in respect of agricultural lands in order to promote vested interests of individuals on the cultivable land. On the other hand forests were brought under State control in order to restrict peoples' rights of entry and use.

However, a large-scale privatisation of the CPRs coupled with the commercialisation of the activities based on these CPRs have almost marginalised the weaker sections of society. It is increasingly found that they had to buy things which they formerly used to receive in the form of traditional claims. Therefore, a collective use of resources within sustainable limits, imposed by a set of rules, through joint land use management and peoples' participation was needed. This need gave rise to informal social arrangements, where local communities were protecting forests situated in the village proximity, which later resulted in formalising the Participatory Forest management(PFM) practices in the form of the Government of Orissa Resolutions issued in 1988 and 1990. In the PFM people felt that they did not have any role in planning aspect, its the Government which is in charge of planning and they were supposed to implement those. Hence participation had not been satisfactory. Realising these limitations, another Government Resolution was issued in 1993 which gave rise to Joint Forest Management(JFM)[1] instead of PFM. In the

[1] Tripathy, A.K.(1996), "*Nishpatti Aapananka Hatare*" (Decision on Your Hand), Utkal Prasanga, Feb. pp.13-19.

JFM both local people and the Government are equal partner in planning and implementation.

4.4 Role of Forests in Orissa

Forest has a strategic role in the socio-economic life of the people of Orissa as it not only contributes to the income of the State, but also it provides basic economic opportunities for the tribals and other rural poor. Particularly the tribals depend upon both timber and non-timber products of forests for their day to day living. Besides tribals, rural folks of Orissa are also quite dependent on forests for various reasons as there is a symbiotic relationship between the poor and forest of Orissa[2]. Similarly, J.P.Singh(1988)[3] had examined the linkage between human civilisation and forest with particular reference to the dependence of rural households on forests and forest products, and had established that 4.37% of the households pursued forestry as their main economic activity while 43.75% as a secondary source. When the linkage was viewed from the angle of economic dependence, as high as 75.72% of the households were found to be dependent on forests for firewood and despite commercialisation of construction materials, 10.44% depended directly on forests. The use of forest products for industrial purposes(cottage industries) was confined to 30% of the households where the adult family members were found engaged in professional trades like basket making, carpentry, processing and pottery making. But, unfortunately, it was observed that despite the heavy exploitation of forests, very small number of households reciprocated in contributing to the national resources by way of participation in mass plantation programme. Further, the National Human Rights Commission(NHRC) has observed that an appropriate forest policy will have a significant role in eradicating rural poverty of Orissa because non-timber forest produce provides cash resources to the rural poor in forest areas.

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[2] Saxena, N.C.(1997), " Forest Policy and Rural Poor in Orissa", Sage Publications, New Delhi.

[3] Singh, J.P., M.L.Chakraverty and H.N.Atibudhi(1988), "Economic Dependence on Forests by Rural Households: A Study in Cuttack District, Orissa", Indian Journal of Agricultural Economics, Vol.43, No.3, July-Sept.

It also provides the raw materials to the agro-based industries and other infrastructure sectors. Moreover, it is a major source of non-tax revenue for the Government. An examination of the Table 4.3 shows that the total forest revenue has increased from Rs.119.05 crore in 1989-90 to Rs.127.21 crore in 1994-95 registering a growth of 6.8% over the years. There has been a gradual increase in revenue receipts from forest products over the years, the only exception being 1991-92 and 1993-94, when there was considerable shortfall in the receipts. Kendu leaf contributes the major share of revenue receipts from forest products.

Table 4.3: Revenue Receipts from Forest Products in Orissa

(Figures in Crore rupees)

Item	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
Timber & firewood	21.10	21.10	18.15	10.40	8.33	19.66
Bamboo	6.32	6.45	7.00	10.00	9.65	12.04
Kendu leaf	82.44	76.85	51.57	78.26	75.35	80.62
Others	9.19	4.68	8.00	5.34	5.97	14.89
Total	119.05	109.08	84.72	104.00	99.30	127.21

Source: Forest and Environment Department, GoO.

To add to it, it contributes many forest products. The economically important timber species are Sal, Teak, Asan, Piasal, Gamhar. Besides these, it supplies kendu leaves for bidi manufacturing. The average annual production of kendu leaves was around 3.8 lakh quintals. Lac had been an important source of foreign exchange earner to the tune of Rs.50 lakh annually for the country. Export earnings from these minor forest products(MFP) were estimated at Rs.48 lakh in 1969-70 as against the corresponding figure of Rs.119 lakh during 1950-51.

Furthermore, forests provide Mahua flowers which have far reaching importance for the rural economy. The calyx of the flowers are generally dried and made into cake which constitute a staple food for the tribal in the lean season. The flowers are also used for manufacture of liquor and cattle feed.

In addition to above, Sabai grass grown in Orissa forests is in great demand for paper manufacture and for rope-making. Its natural occurrence and intensive plantation is contributing to the agro-based industries of the State. Besides the above important MFPs, other important products are honey, resin and broom grass. Forests of the State are also veritable store-houses of trees, shrubs and herbs of medicinal value.

Thus, forests having a potential role for Orissa's economic development, one needs to have an idea about the attempts of the State Government for its development through planning.

4.5 Forest Development Programmes under Five Year Plans

With the changing priorities over period of time, the thrust of planning in forestry sector has also changed accordingly. State development planning in forestry sector has always conformed to the National Five-Year Plans as well as the Forest Policies.

Accordingly, the main focus in the First plan(1951-56) was to consolidate and integrate degraded forests taken over from ex-*zamindars* and princely States. This emphasis continued during Second plan(1956-61) as well, along with some commercial plantations raised under the then scheme of B-Economic Plantations. Forestry as a sub-sector of agriculture was recognised during the Third plan, but the emphasis was again laid on raising large scale commercial plantations to meet the long term requirements for industrial purposes under a Centrally Sponsored Scheme. As a consequence, the outlay of forestry sector was increased and the State was encouraged to establish plantations of quick growing species with Central aid. Further, owing to increasing population pressure on forests, the need to extend tree cover outside traditional forest areas was gradually realised. The Schemes of raising plantations outside the forests, namely, 'Extension Forestry' and 'Farm Forestry' were initiated to extend tree planting on the lands not fit for agriculture(including village commons and wastelands). The main purpose of these schemes was to reduce pressure on traditional forests by creating fuelwood and fodder reserves near villages deficient in forest resources.

The guiding principles for forestry in the Fourth plan were to maintain adequate forest cover and to meet the requirements of wood for industrial purposes. The main objective was to achieve self-sufficiency in the forest produce required by forest-based industries through intensive management of existing forests. The specific objectives of this plan were as follows:

(i) Consolidation and scientific management of all hitherto unorganised forests.

(ii) Strict protection against unregulated cutting.

(iii) The establishment of a permanent organisation to carry out an inventory of forest resources, with a view to assessing the country's supply of raw material for industry and domestic consumption.

(iv) Replacement of forests having slow rates of growth by plantations of fast growing species of industrial value.

(v) Afforestation of barren lands and the formation of manageable units to ensure protection and improvement of productivity.

(vi) Introduction of improved methods of harvesting, and extension of communications to facilitate the exploitation of inaccessible forests.

(vii) Multiple use of natural resources and wild life conservation.

A special scheme of coastal afforestation as anti-cyclone measures was also started in Orissa during this plan.

With regard to first four Five Year Plans budgetary allocations, it has been noted that approximately one-quarter of the forest sector expenditure in the first three plans was spent on economic and industrial plantations, followed by a similar percentage in the Fourth plan. Establishment of fuel wood plantations though started in Third plan, accounted for only 12% and 4% of total expenditure in the Third and Fourth plan respectively.

During Fifth Plan period(1974-79) forestry was linked up with rural development and removal of poverty. Emphasis was laid on harnessing the potential of forestry in rural development by linking it to removal of poverty and generation of employment. The plan further aimed at afforestation of barren land and wasteland to protect the environment and meet the demands of the people for forest produce. Forest Development Corporations(FDCs) were established in many States as per the recommendation of National Commission on Agriculture(NCA), 1976, mainly to convert low productive mixed forests into large scale commercial plantations with the help of institutional finance. Though these FDCs raised some successful plantations, this resulted in conversion of mixed forests of multiple-use into monocrops, which attracted criticisms on socio-ecological grounds.

Being influenced by the environmental concerns and movements, the theme of the Sixth Plan(1980-85) was development without destruction. The forestry sector outlay was increased mainly to implement development schemes like Social Forestry. Even Social Forestry Schemes received funds from other sectors such as rural development. In many forest deficient regions as much as 25% of the total outlay of the rural development schemes was earmarked for social forestry programmes. The main thrust was on saving natural forests from further depletion and the creation of fuel and fodder reserves. Social Forestry programmes were implemented in the State under National Rural Employment Programme(NREP), Rural Labor Employment Guarantee Programme(RLEGP) and Swedish International Development Agency(SIDA) assisted project.

Since the theme of the Seventh Plan(1985-90) of the Government of India was 'Forest for Survival', the strategy of Orissa closely matched with the Government of India. In accordance with the general guidelines laid down by the Government of India for forestry in their approach paper, the thrust of this plan in Orissa was as follows:

1. Re-orient the forest policies and practices in Orissa to involve the rural population in an effort to promote, protect and manage forests and implement afforestation programme geared to the ecological requirements and needs of the rural population primarily through various social forestry activities.

2. To further consolidate the reserved forests.

3. To up-grade and intensify the capacity of the Forest Department in the fields of management planning, evaluation, and monitoring and research in order to ensure a scientifically founded and socio-economically equitable implementation of forestry programmes.

4. To expand and improve the forest education and training programme of the Forest Department in line with the above.

The SIDA assisted Social Forestry Project entered into the second phase after successful completion of the first phase(1983-88). Economic plantation, Forestry research and survey, Development and communication, Intensification of forest management, Forest education and training, and Development of National Parks and sanctuaries were the other main schemes implemented during the plan period.

Socio-economic development through forestry activities was further taken up under the World Food Programme, funded by the Food and Agricultural Organisation of the United Nations. The scheme envisaged payment of wages to the labourers employed in forestry activities in the shape of food materials and cash.

The focus of the Eighth Plan in Orissa was on preservation of existing forests by intensifying protection measures and enlisting people's participation by adopting Participatory Forest Management(PFM) practices. Protection measures included strengthening communication net work and mobile system, and providing adequate man power with arms and ammunitions. In order to ensure people's participation about 6000 Village Forest Protection Committees(VFPC) have been constituted by the territorial wing and they are involved in protection of about 12,000 hectare of peripheral forests throughout Orissa. In addition to this, Vana Samrakshyan Samities(VSS) i.e. Forest Protection Committee have been formed as per 1993 notification on PFM. The main responsibility of VFPCs is to protect has been assigned government forests from illicit felling, fire and encroachment, in exchange of a free supply of firewood, fodder and small timber to villagers at least four times per year.

Table 4.4: Plan Outlays & Expenditure(State & Forestry Sector) of Orissa

(Figures in Crores rupees)

Plan	Total Plan outlay	Total Plan Exp.	Outlay in Forestry Sector	Forestry sect. outlay as % of Tot.Plan Outlay	Forestry sector exp.	Forestry Sect. Exp. as % of Tot. Plan Exp.
1st Plan (1951-56)	20.1	18.4	0.17	0.84	0.17	0.90
2nd Plan (1956-61)	99.7	86.6	0.56	0.56	0.56	0.60
3rd Plan (1961-66)	227.6	224.6	3.28	1.44	3.04	1.35
Annual Plan (1966-69)	132.1	124.9	1.88	1.42	2.37	1.85
4th plan (1969-74)	222.66	249.3	4.30	1.93	4.23	1.65
5th Plan (1979)	588.5	453.6	2.80	0.47	4.57	1.04
Annual Plan (1979-80)	391.0	385.3	4.20	1.07	7.09	1.80
6th Plan (1980-85)	1500.0	1571.8	12.50	0.08	24.73	1.50
7th Plan (1985-90)	3364.0	3339.99	42.50	1.26	78.62	2.30
8th Plan (1992-97)	10000.0	9652.8	173.32	1.73	207.53	2.15

Source : Orissa Forestry Sector Development Programme, Vol.1. Forestry Sector Strategy Analysis. Jan 1995 prepared by Forest Survey of India.

In view of these priorities to increase the forest cover during different plan periods the budget allocations in different plans to forestry sector have gone up from Rs.0.17 crores in First Plan to Rs. 173.32 crores during the Eighth Plan. However in terms of relative shares there are significant fluctuations. While forest sector's outlay as percentage of total plantations was 0.84% during First Plan which declined to 0.56% during Second Plan. But it increased to 1.44% during Third Plan and during Eighth Plan it had gone up to 1.73%. Though percentage wise the outlay have undergone many fluctuations, since 6th Plan the outlays keep on increasing rapidly. The change in outlays from 6th to 7th Plan was 240% and that of 7th to 8th Plan it was 307.8%. The details of the plan outlays and expenditure patterns are indicated in Table 4.4.

But in spite of these planned efforts, there has been large scale deforestations in Orissa owing to population growth, excessive dependence on wood for fuel and construction, extension of farm land to forest areas, rapid industrialisation and urbanisation.

But an examination of the demand pattern of forest products in Orissa has revealed that due to increased demand of forest produce has resulted in large scale illicit felling and poaching of wild animals. To add to it the sector has been relatively neglected. It has been treated by Government as revenue earning sector. The budgetary allocation for forest is meagre compared to other sectors. During the Planning Period from 1951 to 1997, the forestry sector's outlay has been less than 2% of total plan outlay and the expenditure has been around 1 to 2 % of the total plan expenditure. During the period there has been many changes in the organisation changes in the Forest Department of Government of Orissa to cope up with the growing demands of the forest resources.

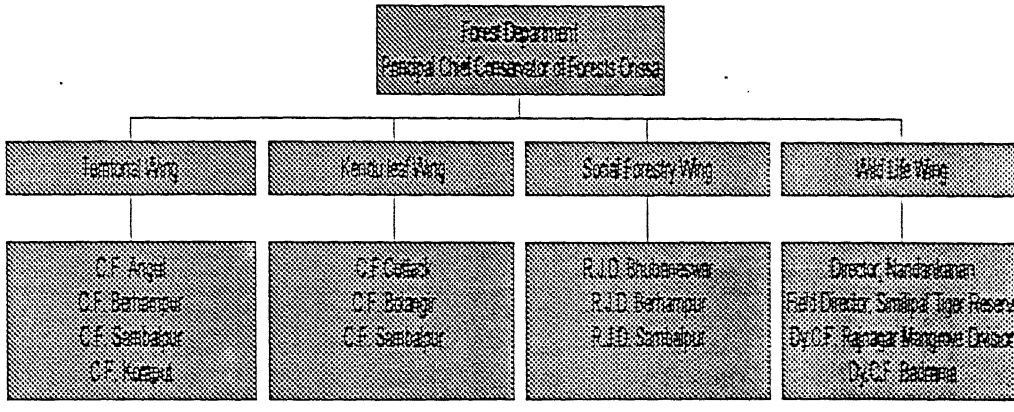
4.6 The Organisational Structure of Forest Department of Government of Orissa

In order to ensure better management of forests in the State, the Government of Orissa has introduced the following organisational structure which is shown in Chart 4.1.

The Orissa Forest Department forms an integral part of the Forest and Environment Department of the Government of Orissa. The Forest Department is headed by Principal Chief Conservator of Forests(PCCF), who is assisted by a Chief Conservator of Forests, Conservator of Forests(Project Formulation and Evaluation), Nodal Officer, Planning

Chart 4.1

Organisational Structure of Forest Department of GoO



Officer, Assistant Chief Conservator of Forests, Deputy Conservator of Forests(Evaluation), Senior Administrative Officer and a Chief Accounts Officer. Under the PCCF there are four wings, viz., Territorial Wing, Kenduleaf, Social Forestry and Wild life. The territorial wing is in charge of all reserved and protected forests of the State. To maintain proper supervision it is divided into 4 circles, viz. Angul, Berhampur, Sambalpur and Koraput circles which are headed by Conservator of Forests. The Kendu leaf wing, which deals with the kendu leaf(revenue-earning factor) trade of the State, is divided into 3 circles, located at Cuttack, Bolangir and Sambalpur. The Social Forestry wing was created in 1983 as a special wing of forest department only to increase in plantation in the State under the assistance of the SIDA. The wing is headed by one Director and for field supervision there are 3 circles at Bhubaneswar, Berhampur and Sambalpur. The wild life wing is divided into 6 circles located at Nandankanan, Similipal(tiger reserve forest), Raj Nagar(Mangrove division), Sambalpur, Sunabeda, and Angul.

4.7 The Plantation / Afforestation Activities in Orissa

As stated above from the very beginning of Five-Year Plans, focus is being given on afforestation/plantation schemes for regeneration of forestry in the State. The total

expenditure pattern on plantation during the five-year plans shows that while it was 29.41% of the total expenditure in the forestry sector in the First Plan, it declined to 26.78% during Second Plan. However, since the Third Plan period its share kept on increasing moderately and its share in Seventh Plan was 81.87%. The social forestry which started during the Seventh Plan at present occupies an important activity of plantations in the State. Its share during Seventh Plan period was 79.17% of the plantation activities. The details of the plan wise expenditure are shown in Table 4.5.

Table 4.5: Expenditure on Plantation Schemes in Orissa

(Figures in crore rupees)

Plan	Total Exp.in Forestry sector	Exp.on plantation activities	Plantation .exp.as % of tot.exp.	Exp. on Social Forestry	SF Exp as % of Tot plant.exp
1st(1951-56)	0.17	0.05	29.41		
2nd(1956-61)	0.56	0.15	26.78		
3rd(1961-66)	3.04	1.59	52.30		
Annl(66-69)	2.37	1.73	72.90		
4th(1969-74)	4.23	2.78	65.72		
5th(1974-79)	4.57	3.31	72.41		
Annl(79-80)	7.09	6.68	94.21		
6th(1980-85)	24.73	19.34	78.23		
7th(1985-90)	78.63	63.82	81.87	50.53	79.17
Annl(90-91)	23.58	19.50	82.69	15.21	78.00
Annl(91-92)	24.33	20.02	82.28	17.28	86.31

Source : Orissa Forestry sector Development Programme, Vol.1, Forestry Sector Strategy Analysis, Jan 1995 prepared by Forest Survey of India

As indicated above out of the four wings of the Department of Forest, two wings are actively engaged in plantation activities, viz., the territorial wing and the social forestry wing. While the territorial wing is confined its activities in reserved forests and degraded forests, social forestry wing is utilising the unculturable waste land, village land, community land and also private land. Besides the Department of Forest other departments like Agriculture Department, Soil Conservation Department are also involved in plantation activities. Another important agency involved in this activity is Orissa Forest Development Corporation, constituted after the National Commission on Agriculture(1976) recommendation, which is primarily involved marketing-trading of forest products. However, with the increase in environmental awareness the industries

have been advised to undertake plantation activities. Mainly there are two motives for their plantation, i.e. (i) to check environmental pollution, and (ii) for raw materials. In addition to all these, now-a-days voluntary organisations have come forward to generate social awareness to protect the environment, and to motivate the people for plantation activities. They are also involved in raising nursery, distributing seeds of high yielding economic species, providing training scientifically raising plants and above all, in encouraging the general public to plantation activities.

4.7.1 Plantation Activities of the Territorial Wing

It was estimated that 1,99,347.57 hectares of forests of Orissa has been deforested by the multi-purpose river valley projects including resettlement of displaced persons, industrial projects and by other construction activities like railways, minor irrigation project, roads and public purposes between 1950 to 1980, and 13733.16 hectares of forest was deforested between 1980 to 1992 with a continuous declining trend except in 1984 and 1985. In order to tackle this problem of deforestation, the territorial wing of the Forest Department had undertaken different plantation schemes over the years.

Though the main activities of territorial division have been protection and regeneration of natural forests, since 1990 it has started block plantation activities in the degraded forests. Initially those plantations were restricted to five districts only which is shown in Table 4.6. The districts where block plantation was undertaken were Ganjam, Puri, Dhenkanal, Mayurbhanj, and Sambalpur. An examination of the figures reveal that Puri district was on the top of plantation in most of the time periods.

Table 4.6: Plantations by Territorial Division in districts of Orissa

(Figures in ha.)

Districts	1990-91	91-92	92-93	93-94	94-95	95-96	dec.96
Ganjam	265.5	405	408	180	190	475	410
Puri	512	363	580	225	376	472	420
Dhenkanal	258	380	480	117	175	360	280
Mayurbhanj	135	150	200	50	80	170	150
Sambalpur	177	224	310	133	170	348	300
Total	1347.5	1522	1978	705	991	1825	1560

Source: The Office of the PCCF Orissa, BBSR

4.7.2 Plantation Activities of the Social Forestry Wing

Although the concept of Social Forestry(SF) was conceived as far back as in 1973, the programme received little impetus until the Sixth Five Year Plan(1980-85) when centrally sponsored afforestation schemes were implemented in 157 fuel deficit districts spread all over the country. Externally aided SF projects were started in 11 States subsequently in addition to few State sector schemes. In Orissa, the SFP was expedited with the assistance from Swedish International Development Agency's(SIDA) which was in assistance the second category of the efforts being put in to promote forestry among the people. In view of these developments, the Forest Department of Government of Orissa created one special wing, viz., Social Forestry Wing to deal with SFPs in the State.

The Phase I of the project was launched in 1983 in 9 districts of Orissa at an initial cost of Rs.230 million over a period of 5 years. The project envisaged to serve the basic needs of the people in respect of fuel wood, small timber, fodder and minor forest produce. It aimed to cover 5,000 villages in forestry production programmes and to assist the rural communities in establishing 21,700 ha. of Village Wood Lot(VWL). It was also planned to make reforestation and rehabilitation of degraded and depleted forest covering 35,300 ha. and Forest Farming for Rural Poor over 600 ha. The Phase I of the project was completed in 1987-88. The IInd phase started in 1988-89 and extended upto 1993-94. It covered 8512 villages. The physical achievement of these efforts in Orissa from 1984-85 to 1993-94 are contained in Table 4.7.

Table 4.7: Physical Achievement of SFP in Orissa from 1984-85 to 1993-94

(Area in hectare)

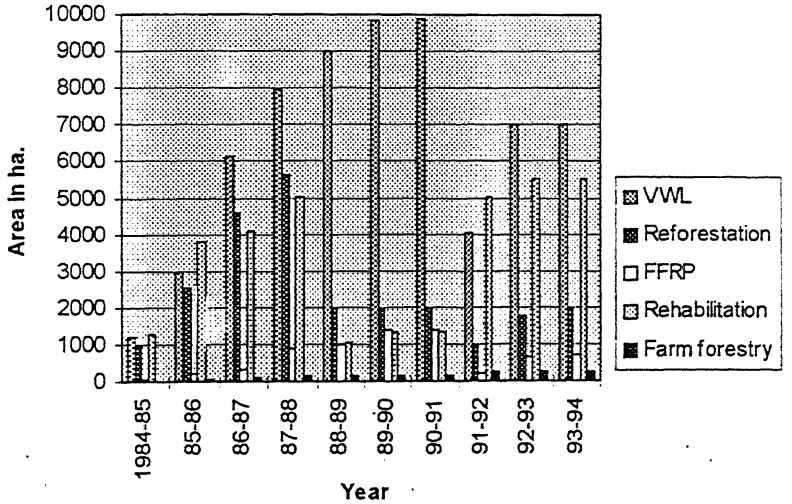
Comp'nt	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	Total
VWL	1203	3008	6158	7976	9004	9820	9897	4040	7038	7012	65156
Reforesta tio	995	2516	4596	5630	2001	1954	1962	994	1785	2002	24435
FFRP	67.9	245	304.5	891	1008	1354	1388	201	644	700	6803
Rehabilit ati	1287	3832	4065	5000	1050	1300	1300	5005	5540	5542	33921
Farm Fores (in lakh)	14.95	67.98	103.7	160	168	180	191	288	300	300	1773.63

Source: (I) Statistical Outline of Orissa
(II) Project Document, Orissa SFP(Phase I)
(III) Project Document, Orissa SFP(Phase II)

The social forestry programme is mainly divided into five schemes, viz. Village Wood Lot(VWL), Reforestation of Degraded Forest(RDF), Forest Farming for Rural Poor(FFRP), Rehabilitation of Degenerated Forest, and Farm Forestry. While FFRP and Farm Forestry are private schemes, the other three are community plantation schemes. Among those five schemes the VWL scheme has been the main component of the social forestry programme as the total area of plantation through VWL is maximum i.e. 65,156 ha (shown in Table 4.7). Hence VWL can be taken as the representative of social forestry programme. The objectives of VWL are:

- to establish tree cover over areas which have become degraded,
- to meet the forestry requirements of the people,
- to create resources primarily to meet the needs of people for products such as fuel, fodder and small timber,
- to create sustainable forest resources by involving the people as individuals and as members of local communities,
- to generate a self reliant forestry production system relevant for the rural population,
- to provide fodder and grass to the village cattle.

Graph 4.2
Physical Achievement of SFP in Orissa



The above Graph 4.2 depicts the area of plantations through different components of the SFPs. From the graph it is very clear that the component VWL is the major one among all the schemes of SFP.

However, as our objective has been to evaluate few plantation schemes of Orissa, after selecting few projects from the sample districts, we have analysed the district wise progress of social forestry, which is given in Table 4.8.

Table 4.8: Physical Achievement of SFP in Different Districts of Orissa

Dist.	1984-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	Total
Puri	-----	1095 12.5	2007.5 20.25	2404.5 24.34	1328.2 21.5	1167.9 27.47	1042 -----	903.8 -----	9948.9 106.06
Cuttack	793 3.5	1407 10.0	1794.5 10.125	2200 15.0	1280 16.0	993 18.42	990 -----	835 -----	10292.5 73.045
Dhenkanal	---	1480 10.0	1436 9.0	2200 14.78	1638 15.65	1280 12.84	1123.5 ------	768.5 28.16	9926 90.43
Balasore	836.5 3.51	155 2.34	1233.5 7.0	1600 16.09	1250 15.72	800 17.01	729 ------	127 ------	6731 61.67
Mayurbhanj	----	1300 10.0	1910 14.07	2300 25.0	1445 19.5	1050 19.30	951 ------	800 -------	9756 87.87
Keonjhar	----	482 1.42	1638 13.22	2450 25.09	1655 21.10	1355 20.0	1081 -------	800 ------	9461 80.83
Ganjam	1462 3.92	1350 7.67	1441 8.78	1734 10.82	1035 10.94	896 10.94	857.5 ------	500 30.0	9275.5 83.07
Sambalpur	461.4 4.02	1927 11.85	2143.5 13.23	2510 21.5	2400 12.1	1046 10.75	1050.5 -------	675 -------	12213.4 73.45
Bolangir	------	205 2.20	1420 8.0	2099.5 10.0	1130 -------	1003 9.98	890 -------	293.4 -------	7040.9 30.18

Note: The first figure in each block is the area of plantation (in hectare) while the second figure is the number of seedlings(in lakh) distributed under Farm forestry component.
Source: Orissa SFP Directorate, BBSR

In the Ist phase of the project only 4 districts were covered, viz., Cuttack, Ganjam, Mayurbhanj, and Sambalpur and then it was extended over to 9 districts. The remaining four districts, namely, Kalahandi, Koraput, Phulbani and Sundergarh, which had rich vegetation were not included under SFP initially. However, towards the end of IInd phase all the 13 districts were covered under the scheme. But due to lack of data we have

presented the data of 9 districts only. An examination of the figures shows that the maximum plantation(10292.5 hectares) had been carried out in Cuttack district from 1984-85 to 1991-92. Sambalpur with 12213.4 hectares of plantation had secured the second position and Puri(9948.9 hectares of plantation) the third position. As far as farm forestry was concerned the maximum number of seedlings were distributed in Puri district, followed by Dhenkanal and Mayurbhanj.

4.7.3 Role of Orissa Forest Development Corporation in Plantations

With a view to increase the revenue of the Government by way of scientific management and harnessing of forest resources of the State, the Orissa Forest Corporation(OFC) was established in 1962 mainly as a marketing-trading agency of State Forest Department. It was the first commercial venture in Indian Forestry Sector. Subsequently the Similipahar Forest Development Corporation(SFDC) was incorporated in 1979 primarily as a marketing trading agency as well as for management and development of Similipahar Forests. The Orissa Plantation Development Corporation(OPDC) was also established in 1985 for raising extensive plantations. The Orissa Composite Board(OCB), a subsidiary company of OFC, was again incorporated in 1983 for manufacturing veneer and plywood. Since there were overlapping in the functions of these corporations the State Government decided to merge the three forest-based corporations of the State into one with effect from October 1990 by executing necessary agreements for sale under the Companies Act. Accordingly, the activities of SFDC and OPDC were merged with OFC. In consideration of the developmental role of the transferred and transferee Corporations, the OFC was renamed as Orissa Forest Development Corporation Limited(OFDC) and the main objectives of the corporation were laid down as follows:

(i) To undertake scientific management and harvesting of forest resources and to carry on marketing-trading on various forest produce so as to generate maximum financial resources for the State.

(ii) To plant, grow, cultivate, propagate, produce and raise plantations of all kinds including commercial and horticultural crops and to look after marketing of the produce therefrom.

(iii) To encourage and establish forest-based industries.

(iv) To buy, sell, import, export, manufacture and deal in merchandise, commodities and articles of all kinds generally to carry on the business of merchants, importers and exporters.

(v) To establish depots at convenient places for supply of timber, fuelwood and other forest products to the local people at reasonable rates.

(vi) To generate more employment, especially in rural areas and to ameliorate the socio-economic conditions of the rural populace, mostly constituting tribals.

As regards the role of OFC in plantation activities we have noted that the Corporation had started raising commercial plantation since 1978-79. It was assigned plantation works further under different plan schemes since 1985-86. In view of its involvement in plantation activities, by the end of 1990-91, the Corporation had raised 1,35,883 ha. of plantations under different plan schemes. Moreover by using its own resources it raised 46,797 ha. of commercial plantation. In addition to these plantation activities, the OFC was involved in promoting many industrial ventures like, Plywood unit in Bolangir, a Saw-dust Briquetting plant at Sambalpur and Bidi manufacturing unit at Angul and a number of saw mills at various field units. In view of these multi farious activities, the turnover of the Corporation which was around Rs.15 lakhs in the year 1962-63 increased to Rs.95 crores in 1988-89, Rs.175 crores in 1989-90 and Rs.186.84 crores in 1990-91. Unlike many State Corporations, this corporation is a profit making unit. Since 1968-69, it has been earning profits after generating a non-tax revenue in the form of royalty. Thus, the Corporation is quite unique in the country because it has undertaken diversified activities like trading, plantations, setting up and managing forest industries such as ply wood factory, bidi making etc., collection of some selected MFPs, research and development, tourism and other social welfare activities.

As we have already discussed, besides Forest Department other Departments of Government of Orissa are also involved in plantations. Department of Soil Conservation is one of those which is discussed in the next section.

4.7.4 Role of Soil Conservation Department in Forestry Development

Recognising the fact that large areas of the country had been rendered useless as a result of soil erosion which resulted from destruction of forests and other vegetation from sloping lands, desert margins and other areas susceptible to erosion. Since fourth plan Government of India has led stress on soil conservation. Under such programme/schemes it was well emphasised that vegetation acts as a protective cover against the forces of wind and water, protecting the soil from being washed or blown away and preserving the physical and hydrographic balance of nature. Forests provide the most effective protection against erosion on hill slopes. Also trees act as wind-breaks, reducing the force of the wind. and the grasses bind the sandy soils. Hence, one of the measures considered for controlling soil erosion and restoring the productivity of eroded lands was afforestation and preservation of forests.

In order to achieve these objectives, in the first five year plan it was mentioned that there was immediate scope for extending the area under forests in three directions, namely—

(i) afforestation as a measure to prevent soil erosion;
(ii) extension of tree lands; and
(iii) establishment of village plantations.

In tune with the first measure, Soil Conservation Department of Government of Orissa has had been involved in afforestation activities. The land with trees is less prone to soil erosion than that land without trees. As pointed out by Rath(1991), ".....we have tremendous problems of soil erosion that has posed a menace to the nation's development. To add to it the exploding population and ever increasing demand for food have put a pressure on our Government for protection of our soil and water." Recognising this crucial role of land development and soil conservation, Third Plan onwards the Government had has emphasised on land shaping, land-levelling in the irrigation commands through various generalised or specialised programmes. Afforestation of already eroded soils, plantation in hilly areas, plantations for which there was no need of irrigation were executed under the soil conservation programmes.

In tune with these perspectives, the Soil Conservation Department of Government of Orissa had undertaken plantation of various fruit trees etc. Among them cashew plantation is the major one. However, in 1980 all the cashew plantation projects were transferred to one Corporation, namely, Orissa State Cashew Development Corporation. In addition to those the Corporation started its own plantation programmes in 8 divisions of Orissa from 1981 onwards. The divisions are Dhenkanal, Khurda, Jeypore, Sambalpur, Sundergarh, Baripada and Chandikhole. The progress of such plantation schemes are provided in the Table 4.9.

Table 4.9: Area of Cashew Plantations in Different Divisions of Orissa

Division	No. of Projects	Area in Ha.
Dhenkanal	76	3612
Khurda	131	8000
Jeypore	106	7200
Sambalpur	57	2886.4
Sundergarh	72	2935.2
Baripada	27	2028.4
Chandikhole	55	2278.8

Source: Orissa State Cashew Development Corporation, BBSR

The table shows that out of the eight divisions Khurda division which was under undivided Puri district had the maximum area of cashew plantations covering an area of 8,000 ha. with 131 projects.

4.7.5 Role of Agriculture Department in Forestry Development

The Horticulture Division of the Agriculture Department of Government of Orissa is involved in encouraging the people to undertake plantation of fruit crops like mango, coconut, banana, citrus, papaya, guava etc. With a view to provide immediate benefits to small farmers, importance is being given for growing short-term fruit crops like banana, papaya and pine apple which generate income after one or two years. The department has nurseries where good quality of plants being raised for distribution among farmers. Besides nursery development they have their own orchards, gardens which are also helping the ecological and environmental balances.

A review of their policies have indicated that one of the thrust area of the 8th Plan was to set up food processing industries and to grow fruits for industries. Since the hill tracts of Koraput, Bolangir, and Kalahandi districts, Phulabani and Ganjam districts were more suitable for extension of horticultural activities, more of the projects of fruit development are concentrated in those areas because it has been realised that development of horticulture sector would not only increase production of fruits and vegetables but also improve the socio-economic condition of the people of the region by providing gainful employment opportunities. To add to the impetus the new agricultural policy of the State envisages establishment of at least one agricultural farm or nursery at Block level to produce and supply quality seeds and seedlings to the cultivators which may be latter extended to Gram Panchayat level. Private entrepreneurs would also be encouraged to establish such nurseries.

4.7.6 Role of Industries in Forest Development

With the extension of environmental awareness in the country, it was well recognised that industrial growth would lead to large scale destruction of the environment. Many studies also established that the growth of industries which emit pollutants or discharge effluents had been much higher in the 1970s and 1980s. Due to new thrust of the Government many consumer goods segments such as paper and leather products, etc., and goods such as petroleum products, fertilisers, caustic soda, iron and steel had experienced a doubling of output between 1961-62 and 1991-92. But such industrial growth pattern along with the industrial transition severely affected the environment because of poor investments for environmental protection. In order to mitigate the environmental damages greater attention was drawn to plantation/afforestation activities. Even the industries and particularly Coal industry and thermal power plants were asked to plant trees inside and outside their plant boundaries. The National Forest Policy of 1988 also emphasised that forest-based industries should meet their raw material needs by establishing plantation on their own which can serve two purpose i.e. inputs to industries and environmental conservation. Keeping all these in mind, few industries in Orissa, had started plantation

works with great interest for instance in Talcher and Ib valley which coal fields industrial activities have already caused substantial air and water pollution leading to adverse effect on the vegetation as well as on the people living in the area due to open cast mining had launched large scale afforestation in the surrounding area under compensatory afforestation programme of Forest (Conservation) act, 1980. Such afforestation schemes are expected to nullify the negative impacts on ecology and environment.

In such an endeavour emphasis had been given on protecting the forest areas and identifying the afforestation programme mainly under aegis of the State Forest Department. The programme would cover not only the forest falling within the mining areas but also degraded forest areas in the vicinity. The afforestation programme upto 2001 AD for both Talcher and Ib valley coal fields as envisaged are given below in Table 4.10.

Table 4.10: Afforestation Programme of Talcher and Ib Valley

(Area in ha.)

Programmes	Talcher	Ib Valley
Company Afforestation	1480	2046.21
Afforestation on reclaimed land	300	700
Afforestation on Mineable Land which will not be mined for next 10 years	1100	110
Improving village forests around the mining areas	240	160
Green belt-planting with avenue trees	100	34

Compensatory afforestation is usually undertaken for the forest land being acquired for mining operations. Besides these, plantation of the degraded forest coming under safety zone of mine is also undertaken. Creation of green belt between residential colony and mine and infrastructure area for improving the environment is undertaken. Avenue plantation is also undertaken. Since these activities increase the net forest cover, the fear of reduction of forest cover due to mining may not come true.

Similarly, the Bolani ore Mines(BOM) of Durgapur Steel Plant of the Steel Aiuthority of India Limited which is the biggest mine in the Keonjhar sector of this belt despatching annually about 1.5 million tonnes of ores, had undertaken plantation in two lease areas - one covering the eastern slope of the Bonai hill range for iron ore, and the second

covering in the valley starting from foot hills right upto Barbil town. The details about the leased, forest therein, and area under mining are given in the Table 4.11.

It may be noted that long before Forest (Conservation) act, 1980, was legislated, BOM undertook afforestation in mid-seventies upon barren patches with fair measure of success. The area covered was approximately 41 hectares with around 80,000 number of trees. But unfortunately, the tempo could not be sustained. Hence recently, there has been proposals to intensify tree planting, but problem are mounting with regard to protection. Unless guarded for 24 hours with strong fencing, plants would not survive both due to cattle menace and human vandalism. Guarding and fencing eat away lion's share of the budget.

On the other hand, Rourkela Steel Plant(RSP) of SAIL had created a horticulture department to look after Green belt development. Further to cope with the requirement of Department of Environment, Forest and Wild life for coverage of 1000 hectares and with a density of 1000 tonnes/acre by the State Pollution Control Board, long term plantation planning has been initiated by RSP in consultation with the concerned controlling units of the State Government.

Table 4.11: Year-wise Plantation in Various Segments of the NALCO

Year	Mines and Damonjodi Area(in Ha.)	Refinery, Plantation	Smelter Plant Area(in Ha.)	and Power Angul Plantation	
1984-91	810.5	1408000	669.1	1167326	
91-92	101.0	161600	110.0	196240	
92-93	100.0	160000	105.0	168400	
93-94	100.0	160000	60.0	140000	
94-95	100.0	160000	60.0	100000	
95-96	78.5	140000	50.0	110000	
Total	1290	2189600	1054.1	1881966	

In the same footing National Aluminium Corporation Ltd(NALCO) had undertaken plantation for environmental preservation. Since 1984 it had taken up large-scale plantation at its mine(Damanjodi), plants and townships(Angul) in order to improve the

ecology of the area covering 2,344.1 ha area with 40,71,366 plantations. The year wise plantations in various segments of NALCO are given in the Table 4.11.

4.7.7 Role of Voluntary Organisations in Forest Development

It is well recognised that Voluntary Organisations otherwise known as Non-Governmental Organisation(NGOs) could act as agents of change for securing people's participation in plantations for environmental movement in our country. The Great Chipko movement, Silent Valley, Tehri Dam Movement and Narmada Bachhao Movement are best examples of voluntary organisations' involvement for environmental causes and protection of forest. The NGOs in our country are associated with many facets of the forestry development in the form of Change Agents in Nursery development, in Promotion of Co-operatives, and in Arranging funds for plantation through their mediatory roles. The latest published 'Directory of Voluntary Organisations in Orissa, 1997' compiled by the People's Development Communication, Bhubaneswar, shows that there are 1,741 NGOs working in different fields of development, social welfare, environmental awareness and promotion. Out of them there are 247 NGOs working in the field of plantation(including forestry, nursery development, agro forestry, and protection of natural forests) and there are 476 Voluntary organisations who are working in the field of environmental protection in Orissa. Their district wise profile is given in Table 4.12.

Table 4.12: District wise division of NGOs engaged in Environmental Activities in Orissa

Districts	Total No. Vol. Organisations	Engaged in Environment	Engaged in Plantation
Balasore	128	49	11
Bolangir	48	18	6
Cuttack	243	73	36
Dhenkanal	179	77	28
Ganjam	135	33	29
Kalahandi	56	9	17
Keonjhar	68	19	9
Koraput	90	20	19
Mayurbhanj	74	22	17
Phulbani	89	10	15
Puri	520	127	44
Sambalpur	80	15	13
Sundergarh	31	9	3
TOTAL	1741	476	247

An analysis of the figure shows that there are wide variations in terms of operations of NGOs in the districts as well as regions. While there are only 31 NGOs in the Sundergarh district, which has a good industrial base like Rourkela Steel Plant, the maximum number of 520 are in operation in the undivided Puri district. A plausible reason why maximum numbers are operating in Puri is that it includes large number of NGOs operating from the capital city of Bhubaneswar. Further, examination reveals that more number of NGOs are operating in the coastal districts, which are relatively more developed in socio-economic terms.

Since in this study our objective has been to evaluate to evaluate few plantation schemes undertaken by different organisations of Orissa. We have resorted to sampling techniques whereby two districts are selected among the undivided 13 districts. The detailed methodology which involves sampling, data collection and application of SBCA of projects is being discussed in the next chapter.

Chapter 5

METHODOLOGY ADOPTED IN THE STUDY

5.0 Introduction

In the previous chapter we have already discussed the development of forestry in Orissa along with an analysis of the key agents involved in plantation activities. In order to accomplish our main objective i.e. to examine the efficiency of various plantation schemes of different organisation in terms of commercial and socio-economic analysis, in this chapter we have investigated into the proper technique and the methodology to be adopted by us. The scope of the technique along with the literature survey are also examined in this chapter. The methods of sample selection, primary data collection and their analysis are discussed in the chapter too.

5.1 Methodological Framework Adopted in the Study

For any micro level empirical study like ours, the choice of an appropriate methodology is very important to draw any meaningful policy implication.

Accordingly, we have adopted the following methodological framework in this study.

(1) The choice of an appropriate planning technique;

(2) Selection of appropriate SBCA method;

(3) The method of selection of sample;

(4) The methods of collection of primary and secondary data for the study;

(5) The method of estimation of externalities; and

(6) To undertake the analysis in terms of social benefit cost analysis.

All these steps adopted are elaborated for a better appreciation of the issues involved in this study.

5.2 The Choice of an Appropriate Planning Technique

An examination of the various stages of planning and its associated techniques reveals that micro level selection of suitable projects is involved in the third stage of planning, and the

general technique adopted at that stage is the social benefit cost analysis(SBCA)[1]. This technique has its origin in applied welfare economics and has played a very significant role historically in natural resource economics and more recently in environmental economics as well. It prescribes the ways and means by which commercial and social decisions regarding the use of scarce resources are undertaken under a planned framework. This technique of economic analysis was initially developed to evaluate investments in water resource projects made by Federal Water Agencies in the United States, principally, the US Bureau of Reclamation and the US Army Corps of Engineers. The general objective of its application had been to provide a useful picture of the costs and gains from making investments in water resource projects. Thus, in the initial years of its application, the scope of SBCA was limited to a few areas like multi-purpose river valley projects, transport, irrigation and power projects. Then it was extended to various industrial projects to tackle some tactical questions at the project level such as questions related to product mix, size and location of the plant, degree of specialisation and expansion, etc. However, of late, we find a wider application of this technique even to the areas of education, health, recreation, family planning, pollution control, etc. The most striking development in SBCA in recent years has been its increasing application to the environmental consequences of new technologies as well as scientific and regulatory programs. For instance, the Atomic Energy Commission used the technique to evaluate the fast breeder reactor research and development program, and the technique has also been applied to other potential sources of hazard and environmental pollution. Thus, the role of SBCA for assessing the overall impact of any investment projects on society as a whole has significantly increased in recent years. Owing to these merits of the tool, we have adopted the technique of SBCA in evaluating our forestry projects. But as there are different methods of SBCA, and we have to choose one of them, we would like to discuss the scope of SBCA, steps involved in SBCA in the following sub-sections.

[1] For details of the stages, see Stephen Marglin(1967), "Public Investment Criteria", George Allen & Unwin Ltd.

5.2.1 Scope of SBCA

The SBCA is essentially a tool to formulate and evaluate a project in terms of the explicit national objectives underlying development planning for the nation as a whole. According to Marglin[2], "BCA is an aid to implementation of the strategy of development, not a substitute for strategy." It purports to describe and quantify the social advantages and disadvantages of a policy in terms of common monetary units. The scope of SBCA has been widened due to the development of various improved methodologies of project appraisal and due to growing interest of professional economists as well as the international organisations like Organisation for Economic Co-operation and Development(OECD), United Nations Industrial Development Organisation(UNIDO) and International Bank for Reconstruction and Development(IBRD), otherwise known World Bank. As a result of these developments, many improvements have been brought in the literature on SBCA in recent years. The SBCA exercises of any project can be taken up either in the ex-ante stage(i.e. appraisal) or in the ex-post stage(evaluation) for providing guidelines for policy-making and decision-making.

With regard to the scope of SBCA in the project analysis, there have been divergent views over time. Macro-economists were of the view that all that mattered for economic development was more investment and not the type of investment. They completely ignored the importance of project analysis(i.e. project appraisal/evaluation) in the framework of BCA. They attempted to upheld their argument on the ground that a number of less obvious externalities are anyway left out of the scope of project evaluation and thereby making the evaluation exercise useless. In their opinion, project management, rather than appraisal/evaluation, was more important.

On the other hand, Little and Mirrless[3](1968) brought out the importance of the technical, financial and economic aspects of a project. In their view, unless the project was well-designed and well planned, a good management would in no way help the project in becoming efficient and economical. More particularly, they emphasised that for the under-

[2] Marglin, S.A.(1967) op cit.
[3] Little, I.M.D. and J.A. Mirrlees(1968), "Manual of Industrial Project Analysis for Developing Countries, Vol II, Social Benefit Cost Analysis", OECD Development Centre, Paris.

developed countries, the goals of planning are to be highlighted while carrying out a feasibility study of any project.

The third set of argument was advanced by Marglin(1967) and the UNIDO(1972). In their view, in an under-developed or developing economy the investment criteria for the public sector should be explicitly related to the objective of growth, and these criteria should come into play in drawing up of project plans. UNIDO has brought out a special role of SBCA for an economy like India. The tool of SBCA helps in resolving a number of conflicts, for example, between different objectives of planning, between interests of different states and even between different group-interests in the same state. Furthermore, SBCA helps to tide over the trade-off situations, that have become a common feature in decision making at the sectoral levels.

In the developing countries, there is an enormous scope for the use of SBCA owing to paucity of basic resources and capital. In the process of decision making and selection of projects these scarce resources and capital have to be put into optimal use. These aspects further assume more importance as there is inefficiency in production processes. The planned goals are to be attained even in the presence of various conflicting goals at different levels. The goals as well as optimal use of scarce resources can be achieved by the application of SBCA at tactical levels.

5.2.2 Historical Development of SBCA

The idea of measuring the net advantages of a capital investment project in terms of society's net utility gains was originated with Dupuit's famous paper 'On the Measurement of the Utility of Public Works', published in 1844. In his work, Dupuit pointed out that 'political economy has not yet defined in any precise manner the conditions which these public works must fulfil in order to be really useful', and proceeded to develop his definition of what we now call consumers' willingness to pay for a good or service over and above its market price, as a measure of the net welfare gain from a project. Despite refinements to the concept and theory of consumers' surplus by Marshall, Hotelling and Hicks, the practical application of the theory to public investments, which had been recognised by Dupuit, was not resurrected until the 1950s. With the advent of

Cost-Benefit Analysis(CBA) the concept came to limelight. The theory of Consumers' surplus suggested a practical way of measuring the social return of a capital project. The flow of services

from the project, multiplied by their prices, merely defined the minimum social benefit. Since some purchasers would have been willing to pay more, they obtained something an excess of utility which constituted consumers' surplus. This aspect of the definition of net social benefit is fundamental to CBA, and is readily extended to cases where persons who are not direct beneficiaries of a project obtain some 'over spill' benefit. They obtain some utility from a good or service for which they have not paid i.e. a consumers' surplus in a context where the market price is zero. It follows that the measurement of net social benefits requires the estimation of all the consumers' surpluses, to whomsoever they accrue. This link between surplus theory and the indirect third-party losses and gains from capital projects was again not taken into account until the 1950s.

The CBA methodology has evolved over the years with increased acceptance by numerous disciplines and government agencies. Formally, it became part of the Flood Control Act of 1936 of USA, and with a land mark 1950 report prepared by the Federal Inter Agency River Basin Committee, it was evolved into a standard guide for water resources planners. The most systematic use of the method occurred in the 1960s, when the Planning, Programming and Budgeting System(PPBS) was introduced as an extension of system analysis in the Department of Defence.

After the 1960s, the impact of CBA on the design and formulation of policies increased significantly and it was accepted as an important planning technique by other countries of the world too including the developed and developing countries. In view of our Government accepting planning as an important tool for economic development of the country, the Indian Planning Commission has recognised the importance of SBCA in decision making process. Initially this was used as a tool for the water resources development projects as well as industrial projects. However subsequently the scope of SBCA has been extended to infrastructure development projects like power, transport,

health, education and family planning. Recently, we find its wide use in the environmental development and pollution control projects in our country.

5.2.3 Steps in SBCA

Projects are the building blocks of the economic development of any economy. However, owing to resource constraints, all the projects proposed cannot be undertaken at any period of time. Projects are to be selected on the basis of technical as well as economic feasibility. The various stages involved in the process of decision making are: Technical Feasibility Analysis, Financial Feasibility Analysis, Economic Feasibility Analysis. These are discussed in the following sections.

(I) Technical Feasibility Analysis

Technical feasibility is the first and foremost step involved in planning of a project. It is undertaken at the stage of project design and plan formulation. Technical feasibility analysis generally deals with the requirement of men, materials and inputs, production technology, product-mix, plant capacity, location and site, machinery and equipment, structures and civil works and work schedule[4]. The input-output profiles in different years are presented. The primary aim of a technical feasibility analysis is to optimise the output by using the scarce resources of input items. This sort of exercise is usually carried out with the help of extensive use of operations research, micro-economic, linear and dynamic programming, Programming Evaluation and Review Techniques(PERT), Critical Path Method(CPM) and other scientific management aids for ensuring optimal allocation of scarce resources[5].

Technical viability is not the only condition, but one of the preliminary conditions for accepting or rejecting a project. This is because there are a number of drawbacks associated with the methods adopted for the same. The most important weakness is that

[4] Chandra Prasanna(1987), "Projects Preparation, Appraisal, Budgeting and Implementation", Tata McGraw-Hill Publishing Company Limited, New Delhi, pp68-82.
[5] Matto, P.K.(1986), "Project Appraisal: A Third World View point", Lancer International, New Delhi, pp133.

the optimisation of efficiency of a project is done in physical terms, and not in monetary terms.

Therefore, if there are a number of conflicting projects, it would not be possible to choose the best one by using the results of the technical feasibility analysis. Moreover, there are a number of technical and human errors involved in the use of the above mentioned scientific techniques of optimisation. Hence, in order to overcome these weaknesses, a financial

feasibility test of the project should be conducted for decision-making.

(II) Financial Feasibility Analysis

The financial or commercial feasibility study of a project is the second step involved in BCA, which basically deals with the profitability aspects by measuring the various direct inflows and outflows for its life span. This analysis is generally used in the private sector to determine the best one from the perspective of private interests. The streams of expected cash/revenues are considered as benefits, and direct payments to factors of production are viewed as costs regardless of their outputs effects elsewhere in the economy. The costs to third-party and society in the form of environmental damage for which the private entity has no obligation to pay are excluded from these cost calculation. The steps through which such analysis is undertaken are:

(i) Firstly, the input and output streams of a project are assessed in terms of physical quantities for the entire life span of the project.

(ii) As the inputs and outputs are expressed in varying units, which cannot be added to one scale, i.e. to a common numeraire in money terms, the physical quantities of inputs and outputs ought to be multiplied by their respective prices per unit.

(iii) Since money has a time value, the stream of benefits and costs have to be discounted to one common period of time, so that all the values become comparable. This task is accomplished in the following way:

$$B = \sum_{0}^{T} \frac{B_t}{(1+r)^t} \quad \text{or} \quad C = \sum_{0}^{T} \frac{C_t}{(1+r)^t}$$

where B= sum of discounted benefits; C= sum of discounted cost; Bt= benefit accruing at time t; Ct = cost incurred at time t; r= rate of discount; T= life span of the project.

For commercial analysis, the discount rate is being approximated to be equivalent to the market rate of interest.

(iv) Once the stream of benefits and costs is discounted, the next step involves the application of one suitable investment criteria.

Traditionally there were four methods used in the corporate sector, viz., Ranking by Inspection(RI) Method, Pay Back Period(PBP) Method, Average Rate of Return(ARR) Method and Debt-Service Coverage Ratio(DSCR) Method. For better understanding of the issues, let us discuss some of these criteria.

(1) Ranking By Inspection(RI) Method

This is one of the most crude forms of investment decision techniques adopted in the earlier days. By this method it is possible, in certain limited cases, to determine by inspection which of the two or more investment is desirable. Suppose two or more investments have some initial costs; the two investments might have identical cash flows for each year through the initial years of the short-lived investment but one continues to earn cash proceeds in the subsequent years also. The investment with longer life would be more desirable.

Another case may arise: the two investments might have same initial outlays, the same earnings life and earn the same total proceeds. But the project that earns more cash proceeds in the initial year is more desirable.

Though this is the simplest and less time consuming, but nothing has been said about the risk characteristics; it ignores the time value of money; particularly this method is ineffective when the life span of a project is very large.

(2) Pay Back Period(PBP) Method

By definition, the Pay Back period is 'the length of time necessary to receive back the initial investment of a project'. Alternatively, PBP is the number of years it takes a firm to recover its original investment from the projects net returns before depreciation and interest costs but after taxes.

Ordinarily, the entrepreneurs first decide a maximum period P* on the basis of their expected returns and then reject all investment proposals for which the PBP is greater than the maximum, i.e. on this criterion a project will be selected if and only if its PBP is less than or equal to the desired maximum PBP, i.e. P< P*.

Clearly, the rule makes no allowance for projects with long gestation periods. Another point is that the interest on the capital should be ignored while calculating the PBP. But sometimes this poses problem when the interest on the borrowed capital is quite a large amount. In spite of its limitations, the PBP method is the most commonly used criteria by the private investors for testing the financial feasibility of a project. They would accept a project only if it pays back in 3-4 years. Private investors are generally not interested in waiting for a longer period of time in order to recover the invested money. But public investors can wait for a longer period of time.

(3) Average Rate of Return(ARR)

Economists frequently use three types of ARR as measure of efficiency, viz., average net return on average book value, average gross return on initial investment, and average net return on initial investment. When the first measure is used, the average income is computed after depreciation. The ratio of income to book value is a common and useful measure of performance, but it is less useful as a device for ranking investments. The second one is defined as the percentage of average annual gross/net returns before interest cost but after depreciation and taxes to the initial investment. For its computation, one simply adds together all the gross/net returns from the project during its life period, divides this sum by the number of years, and expresses the resulting figure as a percentage of the initial investment outlay.

The formula used for its computation is:

$$ARR = \left[\left\{ \sum_{1}^{N} \left(B_t - C_t \right) \right\} / C_0 N \right] \times 100$$

where Bt= benefits flowing in period t
Ct= Costs incurred in period t (i.e. operation and maintenance cost)
Co= Initial capital Cost
N= life span of the project

On this criterion, a project will be accepted if and only if it guarantees an average annual rate of return which is greater than or equal to the firm's desired minimum rate of return, which would, of course, be mutually exclusive alternative projects, the projects with the highest ARR would rank the first and the one with the lowest ARR would rank the last.

The ARR, unlike the PBP method. takes into account all the benefits generated during the entire life span of a project; however it also does not recognise the time value of money. Moreover it has a bias in favour of short-lived investments with high cash proceeds, for it does not consider properly the duration of the proceeds.

Weaknesses of the traditional methods

In the capital budgeting literature it is argued that all these methods are not reliable estimates of the commercial viability because they suffer from a number of weaknesses. Few of the common weaknesses are:

- that the pay back period does not reflect the state of cash proceeds after the system pays back. Moreover, it does not take interest payment as one of the costs even though interest constitutes a major variable cost component of the public projects.

- Similarly, the ARR neglects the interest payments but takes into account the depreciation costs which amounts to duplication of costs.

- Both the PBP and the Terminal value method also neglect the discounting of the costs and benefits which fall in different time periods.

Owing to these common weaknesses associated with these traditional criteria, in recent years, modern criteria, viz. Discounted Cash Flow(DCF) method are being used for project analysis.

Discounted Cash Flows Method

The discounted cash flows, DCF, is a simple method in which the costs and benefits generated by a project over time are discounted and then summed up to obtain an overall figure. If this figure turns out to be greater than zero, then the project in question becomes

feasible, otherwise it fails, indicating that the project does not generate discounted benefits large enough to offset discounted costs. This formula is:

$$DCF = \sum_{t=0}^{n} \frac{1}{(1+r)^t}(B_t - C_t)$$

where t= time, normally expressed in terms of years, 0,1,2,.....n
n= project's life span
Bt = Benefit at time t; Ct= Cost at time t
r = appropriate discount rate
$\frac{1}{(1+r)^t}$ = Discounted Cash flow's discount factor at time t.

The commonly used DCF techniques are;

- Net Present Value(NPV),
- Benefit-Cost ratio(BCR), and
- Internal Rate of Return(IRR).

(1) Net Present Value(NPV)

The NPV signifies the worth of a project over its life-time. It envisages that the stream of costs and benefits for different time periods of the project should be converted into a common index of the base year level with the help of discount rates. The NPV is estimated as:

$$NPV = \sum_{t=0}^{N} \frac{B_t - C_t}{(1+r)^t}$$ where r is the rate of discount.

The NPV criterion gives an absolute measure of the worthiness of a project, i.e. when the NPV is positive, accept the project or rejection when the NPV is negative. Different projects are ranked on the basis of higher NPVs and in the face of budgetary constraints, projects with higher NPVs are taken up first for execution. In India NPV has been accepted as a suitable criterion for decision making at macro-levels.

The NPV criterion is not free from limitations. In the absence of a predetermined rate of discount, the computation of NPV with different rates of interest payments results into a range of values corresponding to these rates. Another problem is that in the absence

of prospective cash flows e.g. prestige advertisements and welfare facilities, the NPV method could hardly provide any guide for decision making.

(2) Benefit- Cost Ratio(BCR)

This method is nothing but another variant of the NPV method. It is otherwise known as the profitability index method. It has become a common criterion for acceptance or rejection of projects in our country. BCR, as the name itself suggests, is the ratio between the discounted benefit and cost flowing from a project over its life-time.

The BCR of a system can be estimated as follows:

$$BCR = \frac{\sum_{t=0}^{N} B_t / (1+r)^t}{\sum_{t=0}^{N} C_t / (1+r)^t}$$

The decision algorithm of the criterion is generally stated as 'Select a project if the BCR exceeds unity, and reject it when the BCR is less than unity'. Indeed, if NPV is positive, it would follow that the BCR would be greater than one and vice versa. But this argument may not hold good universally. Since BCR is another variant of NPV method all the limitations of the later are also applicable to the former.

(3) Internal Rate of Return(IRR)

The IRR is defined as the rate of discount at which the NPV of a project is zero. Alternatively, it is the highest rate of interest at which the project can be undertaken with equal discounted costs and benefits. This critical borrowing rate is called the IRR of the project. The figure 3.1 shows the NPV curve at alternative discount rates. NPV is lower at higher discount rates. At the point where the NPV curve intersects the horizontal axis, the rate of interest is the IRR. Beyond that point, the NPV of a project becomes negative.

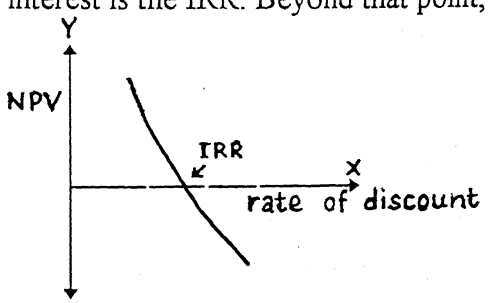


Figure 5.1: NPV at different discount rates

Thus, IRR indicates the maximum rate of interest which a project can bear in the market. On the other hand, if the IRR is greater than the rate of interest which is being paid on the capital invested, then the project is accepted, or else it is rejected.

However, IRR is not a very reliable estimate as at times it becomes indeterminate. Sometimes this method may lead to incorrect decisions, particularly in the case of mutually exclusive projects.

The Appropriate Decision Rule

There are ambiguities involved in using the BCR and IRR rules. Depending on the procedure used in treating recurrent investment costs, the evaluation may result in different B-C ratios. If recurrent costs are included as costs rather than treated as negative benefits, the B-C ratio is likely to be different. However, the problem can be avoided if the analyst consistently uses one form of BCR with recurrent costs included in the same way they are counted in the NPV computation. Another problem relates to the IRR rule. When projects are of various sizes, this rule does not provide a reliable basis for comparison. A project with a high IRR may not be superior to one with a low IRR if the former yields net benefits in thousands of rupees and the latter in crores of rupees. Also a project sometimes may have more than one internal rate of return and consequently, the evaluation is inconclusive.

Because of these limitations, the NPV rule seems to be the most reliable. But there are situations in which the NPV may provide misleading results, i.e. when the budget is limited or when the public sector projects having long gestation periods redistribute income between different generations. Forestry is an excellent example where more than one generations are involved in redistribution of income. In case of forests, when felling takes place now, the present generations reap the benefits of a plantation which was by undertaken by earlier generations a long time ago. This phenomenon, however, is not only confined to forestry; almost all public sector investment projects involved such tactical questions of varying degrees depending upon the gestation periods involved. Evaluating

these projects by means of the NPV criterion results in discrimination against future generations. This argument was given by Kula(1989) in the Journal 'Environment and Planning'. In the NPV criterion the discount factor $1/(1+r)^t$ which is used to deflate future costs and benefits, is a decreasing function of time and approaches zero over time. Multiplying distant costs and benefits by the relevant factor reduces them to insignificant figures. The higher the discount rate lower the present value of the future costs and benefits. In this respect Nash(1973) and Page(1977) argue that by following the rules of this method present members of society could pass great costs to future generations by undertaking projects, the heavy costs of which would appear in the distant future, or fail to undertake projects which may have a very low construction and maintenance cost now but yield large benefits in the years to come.

Modified Discounting Method (MDM)

In order to avoid the above problems, another method known as 'Modified Discounting Method' is developed by Kula(1987). In the NPV method whatever treatment is given to the present generation, if the same treatment is given to all individuals and the discounted net consumption benefits are summed, this gives an overall figure. This method is called modified discounting or the sum of discounted consumption flows, which measures the overall worth of a project to individuals who actually receive the net benefits arising from it. The formula used for this purpose is:

$$MDM = \sum_{t=1}^{n-1} \left[\sum_{k=2}^{t} \frac{NB_t}{I^{k-1}} + (n+1-t)\frac{NB_t}{I^t} \right] + \sum_{t=n}^{N} \left[\sum_{k=1}^{n} \frac{NB_t}{I^k} \right]$$

where NB_t is the net benefit of the project accruing to each individual at time t;n is the life expectancy of individuals; t is the age of the investment; N is the life of the project; k is an index number for calculation representing each cohort recruited into the population; and I equals (1+r) where r is the social time preference rate.

Difference of MDM and NPV criterion

There are some notable differences between the MDM and the NPV criterion and those are:

(i) In the NPV criterion the NPV is a function of time and discount rate. On the other hand, the overall figure obtained by the MDM is a function of life expectancy of individuals and size of population, as well as the rate of discount.

(ii) In NPV criterion there is a single time point, the Present, to which the entire future economic consequences of all investment project under comparison are brought. However, in the MDM there is not a single time point, but rather a number of points, each representing a period when an individual recipient becomes aware of his future share of benefit or cost which will accrue to him as a result of the project in question. These time points are common for all projects under comparison.

(iii) In the NPV criterion the discount factor diminishes with time. On the other, in the MDM the discount factor does not decrease continuously but remains constant from the point when the relationship between the project and the recipients is stabilised.

In the case of short run projects, the results obtained by either method will not differ significantly. For long-living projects the life times of which extend over many generations, the MDM will yield a figure considerably different from that obtained by the NPV criterion.

Thus, from the above discussion we got to know that there are two methods for evaluation of long-gestation public projects like forestry: one is the NPV with very low social discount rate; and the other one is Modified Discounting Method. Since the MDM is based on the assumption that the size and structure of the population is more or less stable, which is not valid for a developing country like India, we have used the NPV method rather than the MDM.

Limitations of Commercial Analysis

But as regards the viability of the commercial analysis, we have noted that it is not free from weaknesses. First of all, it does not take into consideration the presence of market imperfections in a developing economy. These market imperfections are reflected in the form of distorted prices of inputs and outputs. Secondly, the planned goals of equity and social justice, which are very important for a developing economy are also ignored in this analysis. Thirdly, the estimates of inflows and outflows do not take into account the indirect flows or the much discussed concept of externality, which have been recognised as having an important bearing on the decision making of any project. Fourthly, the benefits and costs are not measured in terms of the broad goals of planning or in terms of accepted international numeraire. Fifthly, the technical, managerial and human errors

associated with estimation of input and output flows also influence the commercial calculations. Therefore, it has been well argued in the project evaluation literature that in order to take care of these weaknesses, the commercial feasibility calculations should be followed by an economic feasibility analysis.

Anyway, in spite of these limitations, the commercial feasibility analysis still holds the key for decision making in the private sector. The projects in the private sector are solely selected on the basis of commercial calculations.

III. Economic Feasibility Analysis

In the wake of a significant rise of the public sector projects as well as in view of a number of restrictions imposed on the public sector projects, now-a-days it has become imperative for the decision makers to evaluate the efficiency of any project from the social angle. The primary aim of any project in the public sector should be that with limited resources, maximum number of planned objectives should be achieved. Therefore it becomes utmost importance to study a project from the view of the society also. This needs moving from commercial feasibility analysis to economic or social feasibility analysis. In undertaking such exercise, a number of corrections have to be brought about:

(i) As far as the benefit and cost estimates are concerned, both direct and indirect benefits and costs should be taken into account.

(ii) Since the market prices are distorted, the price of commodity is not equal to its marginal cost nor the price of a factor is equal to its marginal productivity. Therefore, this imperfection has to be adjusted by the use of shadow prices.

(iii) The inter-temporal and inter-regional adjustments of benefits and costs are to be taken into consideration. This would include the regional income redistributive adjustment, group income redistributive adjustment and the project's impact on future savings and investments.

(iv) The next stage is the selection of a social discount rate. This discount rate is generally fixed by the Government.

(v) Application of the investment decision criteria

(vi) Ranking of the projects

(vii) Selection of the project

The economic feasibility analysis suffers from some deficiencies too. First of all it is not easy to measure the benefits and costs in terms of a standard numeraire. Besides the complications involved in estimation of benefits and costs, the estimation of shadow prices really poses a serious problem. Furthermore, the determinants of weights to take care of regional and group inequalities is a difficult task for the project evaluator. There are also problems associated with the selection of a particular method of project evaluation because the approaches of each one of them are different. There are conflicting opinions in selecting the appropriate rate of social discount.

The Choice of Discount Rate

In respect of the choice of discount rate, the literature shows that till late sixties the economists seemed to be satisfied with the rate of interest as choice of test rate of discount[6], for appraisal of public-sector projects. But in 1968 Alfred attempted to calculate the discount rate on the basis of rate of return. In order to calculate the same he estimated a rate of return, of 6.2% for the United Kingdom economy as a whole. After considering the income tax on profits he then increased the figure to 7.1% which was close to the Government's first proposal of 8% of rate of discount for public sector projects.

Alternatively, some economists realising the problems associated with rate of return as the rate of discount, argued that the proper rate of discount should be the Social Opportunity Cost rate which is defined as the one that measures the value to society of the next best alternative investment project in which funds could have been employed.

Another school of thought suggested the use of the Social Time Preference Rate as the discount rate which is also known as the consumption rate of interest. This school

[6] Test rate of discount is otherwise known as social rate of discount.

argued that the reason behind putting money in investment projects is to enhance future consumption capacity. In other words, an investment project involves a trade-off between present and future consumption. Therefore, what we need to do is to ascertain the net consumption stream of investment projects and then use the consumption rate of interest as a deflator. However, the economic theory suggests that in the choice of a social rate of discount, the social opportunity cost rate and the social time preference rates, should play a joint role(Fisher,1930; Eckstein 1957,1961; Feldstein, 1964,1974; Marglin 1963). By using this rationale they have advocated a social rate of discount of 10% for public sector projects.

The strongest objection to the test rate of discount came from the pro-forestry lobby and forestry economists, such as, Price(1973, 1976) and Helliwell(1974,1975) argued that the 10 percent test rate of discount had ended the hopes of an economic rationale for forestry investment in the United Kingdom. Even earlier studies on forestry in Britain had revealed that a very low discount rate was needed, so that a positive discounted cash flows figure could be obtained.

In the discounted cash flows method with a discount rate as high as 10 percent the power of discounting practically wipes away the distant benefits that arise from the final output in forestry. In order to salvage forestry projects, forestry economists have persistently argued for the use of lower rates of interest than the test rate of discount. Their argument was based on the ground that unlike fabricated goods the risk of land-based investments such as forestry becoming worthless in the distant future is extremely low. This argument is also supported by Ian Livingstone and Michael Tribe[7]. According to them if we apply the same discount rates to all projects, then forestry projects of all kinds will be disfavoured relative to other types of projects of shorter term because of the inherently long gestation period involved in tree growth. Moreover, forestry schemes are generally characterised by heavy initial costs, low recurrent costs and delayed benefits.

[7] Livingstone, Ian & Michael Tribe, "Projects with long time horizons: their economic appraisal and the discount rate", Project Appraisal, Vol. 10, No.2, June 1995, pp 66-76.

Coming to Indian context Sharma et al.(1991 b) have estimated the Social Discount Rate(SDR) for land-use projects(like Social Forestry) in India as 2% based on an inter-temporal social utility model. It accounts for inter-temporal consumption by determining the optimum overall rate of foregone current consumption and represents government policy with respect to the desirability of consumption at different times.

The above discussion leads to one point that for evaluation of forestry projects in terms of NPV, a low social discount rates of the order to 2-3% is most suitable for India.

5.3 Selection of Appropriate SBCA Method

Due to wide spread use of SBCA since the 1950s and more particularly, due to the popularisation of the planning techniques in almost all the countries of the World, the need was felt to develop some systematic techniques or methods of evaluation of projects. Such wide felt needs induced a number of international organisations, research institutions and academicians to develop some scientific methodologies of evaluation of projects. As a result of those efforts the prominent methods which have been developed at the international level are:

1. The OECD Manual Method
2. The UNIDO Guidelines Method
3. The Effects method
4. The World Bank Method

The basic features, approaches and techniques suggested in each of the methods, that would provide a better understanding to the approaches adopted by us are presented below:

I. The OECD Manual Method[8]

With the increase in project aid flows and associated technical assistance that took place throughout the 1950s and 1960s in the world, Agencies through which such funds were channelled found it increasingly important to lay down standards of appraisal determining

[8] Little. IMD and JA Mirrlees(1968), "Manual of Industrial Project Analysis for Developing Countries, Vol. II: Social Benefit-Cost Analysis", OECD Development Centre, Paris.

economic viability, particularly in the field of industry and infrastructure investment to which the bulk of such aid was flowing. The result was an increase in demand for appraisal methodologies and practitioners, initially met by economists trained in developed countries and later supplemented by economist with practical experiences of development planning in Third world countries. These new methods, borrowed the ideas heavily from welfare economics, optimisation techniques including the field of operations research.

In such a background the Organisation for Economic Co-operation and Development(OECD)[9] was set up under a Convention signed in Paris on 14th December, 1960, which aimed at promoting the policies designed towards:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in member countries, while maintaining financial stability- and thus to contribute to the development of the World economy;

- to contribute to sound economic expansion in member as well as non-member countries in the process of economic development;

- to contribute to the expansion of World trade on a multilateral, non-discriminatory basis in accordance with international obligations.

In view of the OECD countries involvement in international capital flows, it constituted a consultative group to devise a standard method of project appraisal. I.M.D. Little and J.A.Mirrlees were hired as consultants to develop such a technique, which was published as OECD Manual in 1968, which was undoubtedly a major breakthrough. Although its authors identify themselves within the mainstream of neo-classical tradition, many of the assumptions used in their analytical framework are more consistent with a socialist view that the State is the prime organiser of investment activity to maximise social welfare.

[9] The members of OECD were Australia, Austria, Belgium, Canada, Denmark, Finland, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Spain, the Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

The publication of the Manual created a stir amongst academics and planners. Although nominally it was intended as a Manual for the evaluation of industrial projects in LDCs, the work rested on the theoretical foundations lying within the mainstream of the neo-classical tradition. The planning implications of the Manual, otherwise known as Little-Mirrlees(LM) method , if prophetic to some seemed demonic to others. It was argued that if project level decisions could be got right, the rest could largely be taken care of to make successful project decisions by using World prices as the basis for evaluation of all inputs and outputs. The existence of goods and services in consumption or production which were non-traded was neatly taken care of by the proposal to break these down into their tradable components; 'uncommitted social income measured at border prices' was recommended as numeraire rather than consumption, or traditionally 'domestic value'. The method incorporated related adjustments for taking care of domestic factor market distortions.

In view of the severe criticism of the OECD Manual in the developing countries, the original authors of the OECD method, viz;, Little and Mirrlees[10] revised the volume in 1974 and published it entitled 'Manual of Industrial Project Analysis for Developing Countries, Vol. II, Social Cost-Benefit Analysis'. The methods as described in the revised Manual have been developed to a great extent to include such projects as agricultural, irrigation and other rural projects. Moreover, the treatment of shadow prices was revised to incorporate the income distribution effects. The calculation of benefit of non-traded commodities is emphasised upon. Income and employment distribution has been considered as one of the important factors in project evaluation. The principles have been applied to private overseas investments, and the use of project evaluation by the donor agencies is also discussed.

II. The UNIDO Guidelines Method[11]

As a reaction to the OECD Manual method, which was developed from the point of view of the advanced capitalist countries, the UNIDO set up a consultative group for devising a

[10] Little. IMD and JA Mirrlees(1974), "Project Appraisal and Planning For Developing Countries", Oxford & IBH Publishing Co. New Delhi.
[11] DasGupta, P, A.Sen and S.Marglin(1972) "Guidelines for Project Evaluation", United Nations, New York.

1. Calculation of financial profitability at market prices;

2. Shadow pricing of resources to obtain the net benefit of economic(efficiency) prices;

3. Adjustment for the project's impact on savings and investment;

4. Adjustment for the project's impact on income distribution;

5. Adjustment for the project's production or use of goods such as luxury consumer goods and basic needs whose social values are less than or greater than their economic values.

Stage one is a prerequisite for any sort of benefit cost analysis for a project. Stage two is necessary as there are market distortion or imperfections prevalent in the economy. In order to get over these price distortion, the use of shadow pricing becomes imperative. Stage three is important for those projects that generate benefits to groups who save very little out of additional income, especially in countries short of capital because of a gap between actual and needed savings. Stage four, on the other hand, depends on the priority the Government gives to increasing the income of the poor and on the degree to which the project generates more than average benefits to either the very rich or the very poor. And finally, stage five is advocated in those cases only when the project produces or uses a good whose social value is substantially greater than or less than its economic value.

III. The Effects Method[13]

This method was developed by two French economist, viz., Prou and Chervel(1970) and the original writing was in French language. The Effects method of project evaluation has not gained much popularity; it was widely used in French speaking African countries, viz., Algeria to Upper Voltar. In this method, the benefit is measured in terms of the increment in domestic value added due to the production from a project, net of value added due to the domestic production of inputs. Benefits and costs are measured in terms of the difference between the 'with project' and 'without project' situations. In case of import substitution project, the domestic value added is said to be the difference between the

[13] Balassa, Bela(1976), "The Effects Method of Project Evaluation", Oxford Bulletin of Economics and Statistics, Vol. 38, No.4.

domestic value added in the project, and the loss of export projects, it is the value added net of export subsidies and taxes.

As regards the use of shadow prices, Prou and Chervel did not favour it. For this purpose, they assumed the shadow price of land and labour as zero. Like the OECD Manual and The Guidelines method, the Effects method too made adjustments to incorporate the regional disparities by assigning additional weight to the low income group.

IV. The World Bank Method[14]

This method was developed by Squire and Van der tak for evaluation of the World bank financed projects in the underdeveloped and developing countries. This method recommended a more systematic and consistent estimation and application of shadow prices than those which have characterised project analysis in the past. It describes methods for calculating rates of return that takes into account of the impact of a project on the distribution of income in a country, both between investment and consumption and between rich and poor.

In this methodology the benefits are defined relative to their effect on the fundamental objectives; costs are defined relative to their opportunity costs, which is nothing but the benefits forgone by not using these resources in the best of the available alternative investments, that cannot be undertaken if the resources are used in the project. The forgone benefits are in turn defined relative to their effect on the fundamental objectives. By defining costs and benefits in this manner it is ensured that no other project, which would use the same resources would be more acceptable in terms of the country's objectives.

The shadow prices under this approach would depend upon the value parameters of the Government, on the technical and behavioural parameter and on resources and policy constraints. The value judgement of the Government, in its turn would depend upon

[14] Squire Lyn and H. G. van Der tak(1975), "Economic Analysis of Projects", World bank Publication.

the goals of planning. Therefore, if the World Bank has to carry out a feasibility study of a project in any country, it has to be very clear about the broad goals of planning of that country. Value of traded goods is measured in terms of cif and fob prices. These border prices are converted into the local currency. Non-traded goods are measured by domestic prices in local currency. They have also advocated to use standard conversion factors to take care of the estimations of shadow prices.

V. Application of These Methods

Early work in SBCA was chiefly concerned with establishing the scope of benefits and costs to be taken into account, popularising the discounted cash flow method and related decision rules, and valuing particular types of costs and benefits not readily priced by the market. Such work rested firmly on the neo-classical notion of consumer sovereignty; willingness to pay being the ultimate yardstick of welfare and the market being assumed to function efficiently so long as competitive conditions prevailed. As far as applications of SBCA to certain types of non-marketed goods and services are concerned, Blaug(1968) on education, Harrison and Quarmby(1969) on time saving, Mishan(1971) on human life, , Lal(1974) on social welfare of wells in Maharashtra, Scott, et al(1976) on project appraisal in Kenya, Rath(1980) on flood control benefit estimation are noteworthy. While Lal and others have adopted OECD approach, Rath has adopted UNIDO approach with few modifications. In his study Rath has shown that the indirect benefits of flood control of a dam project are much more than the direct benefits, which ought to be taken into account in justifying any investment on flood control projects in India. In view of wide use of OECD Manual, World Bank and UNIDO Guideline Methods, we have undertaken a comparison among these methods, which can provide a base for selection of an appropriate method for our study.

Since there are so many methods, project planners may face difficulty in deciding the method to be adopted for their study. Before the project planner decides to adopt one of these methods, he should be aware of the comparative results. The most striking difference is the choice of numeraire. OECD manual chooses its numeraire as 'uncommitted social income measured at border prices', whereas UNIDO's numeraire is

'aggregate consumption measured at domestic market prices'. This difference exists basically due to the difference in the objective of the methods. For the OECD group of countries, future consumption is more important, whereas for underdeveloped countries, the first and foremost objective is that of raising the standard of living of the people, therefore, present consumption becomes more important.

The second difference lies in the treatment of taxes on final non-traded consumer goods by these two methods. The OECD method, always treats such goods net of taxes, whereas the UNIDO method values them gross of taxes, with emphasis on the domestic market prices.

Thirdly, unlike OECD method; the UNIDO Guidelines method lays emphasis on 'bottom-up' rather than 'top down' procedures. That is to say, the OECD method gives higher weightage to the income flowing to and from the poor section of the society.

Despite these differences, both calculate an accounting price in order to correct the distortions in the values of foreign exchange, savings and unskilled labour.

The World Bank Method has drawn its concepts from both OECD and UNIDO Guidelines method. Like OECD, its numeraire is the foreign exchange, and the economic prices of traded commodities is estimated at the border prices. There is a use of conversion factor like the OECD method.

From UNIDO Guidelines, World Bank Method draws such ideas as the shadow pricing of labour and the regional redistributive correction. All along, World Bank is more close to the OECD method of project evaluation. The only new concept introduced by the World Bank method is the allowance for risk and uncertainties associated with the project.

In general, all these four methods advocate the use of Discounted Cash Flow Analysis, and they all make allowance for inequality. All these methods use shadow prices to correct the imperfections in the market prices. Though Prou and Chervel are not in

favour of shadow wage rate of zero to land and labour means that they did not ignore this concept completely. Indirectly they included it into their analysis.

Among these four SBCA methods, we have preferred the UNIDO Guidelines Method because it 'offers a more thorough treatment of Cost-Benefit Analysis applied to poor countries than can be found today in any other volume or monograph'[15]. The approach seems to be more realistic because its choice of numeraire in terms of aggregate consumption which not only reflects the choices of the present generation and which is capable of reflecting the current welfare of the people. Moreover, aggregate consumption is capable of taking care of other planned goals of the country. The approach also takes into consideration the political and administrative constraints, whether implicit or explicit, in the calculation of the national parameters. Furthermore, as UNIDO Guidelines is based on partial equilibrium approach, it is best suited to a country like India which has adopted partial planning. Owing to these merits we have decided to adopt the Guidelines approach with few modifications in various parameters and estimation of variables in evaluating various forestry schemes.

5.4 Method of Sample Selection

As the method adopted is a case study approach, which involves collection of a lot of primary and secondary data, we have adopted a cautious approach in selection of sample units. Keeping in mind the time constraints as well as no personnel help for data collection, we have selected four different categories of plantations projects. Among those four groups, two are directly owned by the Government of Orissa, one by Cashew Development Corporation of Orissa and the fourth one by Industry. Even within the Government owned projects, there is a difference, i.e. one is purely meant for local people and the other aimed at both local purpose and as well as to increase the area of reserved forest.

[15] Mishan, E.J.(1974), "Flexibility & Consistency in Project Evaluation', Economica, February.

In terms of the recently developed World Bank's concept of BOOT[16](Build-Own-Operate-Transfer) projects, we have classified these projects into DBOT(Design-Build-Own-Operate) and BOO(Build-Own-Operate) category. The social forestry project which is designed, built and owned by Government but after three years are transferred to the Village Forest Committees for maintenance and harvest, are classified as DBOT. On the other hand, all other projects which are built, owned and operated by the same organisation are classified as BOO projects in this study.

By adopting a multi-stage sampling approach[17] the sample units have been selected by us from the DBOT and BOO projects. In the last chapter, we have already examined the district level plantation activities through various agents, where it is noted that among the undivided 13 districts of Orissa, Puri district is the one having the maximum plantation activities undertaken by most of the agents. Besides plantations, it is also observed that there are maximum number of voluntary organisations involved in increasing environmental awareness in the district. Hence for our study we have selected Puri as our sample district.

The geographical location of the Puri district, shown in the Map given in the Annexure, indicates that Puri is situated at the eastern part of the State of Orissa and it is one of the coastal district. This district is bounded on the east by Bay of Bengal, Boudh-Kandhamal district and part of Ganjam district on the west, Cuttack district on the north and Ganjam district and Bay of Bengal lies on the south side. According to 1991 Census, the population of Puri district was 35.7 lakhs. It is one of the thickly populated district of the State. The density of population is 341 per sq. km. Since in this study our concern is with the forestry sector, it will be appropriate to discuss the forest and plantation activities of the district.

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[16] Kapashe, S. and KM Anantharamaiah(1996), "BOOT PROJECTS-THE RISKS AND THE OPERATOR", Transportation, IIM, Bangalore.

[17] The first and second step being the choice of the State Orissa and the choice of the district Puri respectively.

5.4.1 Forest and Plantation Activities in the Puri District

Forest extends over an area of 3,107.08 sq. km., which is about 27% of the total area of the district. However, most of the forest area lies in earlier Khurda and Nayagarh sub-divisions of the district. For administrative purposes, there are two forest divisions, namely, Puri and Nayagarh. Puri division is comprising of most part of Puri, Khurda and Bhubaneswar sub-divisions. The forest of the division falls under the classification of dry ever green or ever green. On the other hand, Nayagarh division covers the entire Nayagarh sub-division. The forest of this division is broadly described as tropical moist deciduous forest or otherwise known as sub tropical forest. However, the forest cover is shrinking in

the area rapidly which was acknowledged by the forest department only in the last part of 1980s. In order to overcome the problems they planned to increase the area through block plantation and accordingly they started regeneration of degraded forest(RDF). Particularly in the coastal shelter belt a number of patches of casuarina block plantation was undertaken in the 1990s by the territorial division of forest department. The area of block plantation and the area of RDF in Puri district are shown in Table 5.1.

Table 5.1: Area of Block Plantation and RDF in Puri

(Area in hectare)

Year	Block Plantation	RDF	Total
1990-91	302	210	512
91-92	213	150	363
92-93	265	315	580
93-94	225	0	225
94-95	186	190	376
95-96	182	290	472
96-97(upto Dec 96)	130	290	420
Total	**1503**	**1445**	**2948**

Source: The PCCF Orissa, BBSR

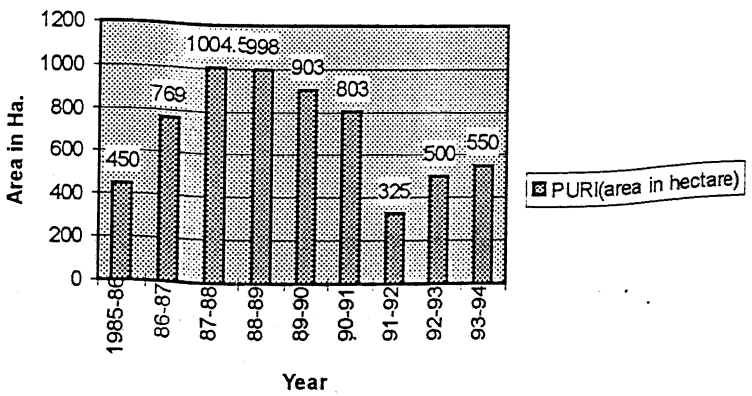
As the table shows 1,503 hectares of land has been already planted with block plantation and 1,445 hectares of forest area has already been regenerated in Puri district between 1990 and December 1996. From among those block plantations two projects have been chosen for our study taking into account both likelihood of availability of data

and possibility of visiting the sites. Those two sample projects are Balukhanda Coup 11 and Balukhanda Coup 13, both in the Puri sadar block. Both of these projects were started in 1990-91. The details of those projects are described in the next chapter.

As far as the SFPs are concerned, Puri SFP division was established on August 1984 with the Head Quarters at Bhubaneswar. Though the division was established in 1984, the actual plantation activities commenced in 1985. The division comprises of 12 ranges covering 29 C.D. blocks of the undivided Puri revenue district. The project ranges are Bhubaneswar, Balipatna, Bolagarh, Khurda, Tangi, Nachuni, Puri, Gop, Delanga, Nayagarh, Dasapalla, and Khandapara. Various components of SFPs under the community plantation(like VWL, Institutional Plantation etc.) as well as individual plantation(like Fst Farming for Rural Poor, Farm forestry etc.), are being undertaken in these ranges.

Among various components of SFPs, we have noted that the VWL is the major community plantation activity because it satisfies a number of objectives of SF programmes. Hence we have taken into consideration this VWL component as representative of SFP. The year wise plantation achievements in Puri district, shown in the Graph 5.1, shows that there are 6302.5 hectare(nearly 10% of total area VWL of Orissa) of VWL plantation in Puri between 1985-86 to 1993-94.

Graph 5.1 Area of VWL in Puri



After detailed discussions with the officials, we learnt that the VWL unit at Gopalpur in the Puri sadar block and Mundal in the Jatani block are the successful projects. These two projects are taken as the sample units for our study. Details of the two projects are discussed in the next chapters.

When we discussed the achievements of the Soil Conservation Department of Government of Orissa, it was pointed out that plantation schemes to expand cashew production during the 1970s and 1980s by the Department has been transferred to the Orissa State Cashew Development Corporation, which pursue two main objectives: viz., to conserve soil and to grow cashew as those lands are good for cashew only. It was reported by the Cashew Corporation that it had maximum area of plantation in Khurda division of Puri district, with Ranpur cashew project as one of the most successful project of the division. Besides, the area of plantation is quite large i.e. 255 hectares. Another successful project is Kadamjhola 3 project which covers over 62 hectares of land. Both these projects were commenced in 1981-82.

While exploring the plantation activities by industries we came to know that there are no such industry involved in plantations in Puri district. But we were informed that the National Aluminium Company(NALCO) and Ballarpur Industries Limited(BILT) are the two industries which are involved in major plantations, of course, for different purposes, i.e. NALCO project for environmental protection and the BILT project for raw materials.

Accordingly, the following eight sample units from four groups have been covered by us in this study:

Group A: Directorate of Social Forestry Projects, Forest Department, Government of Orissa

1. Gopalpur VWL, Puri sadar block, Puri.
2. Mundal VWL, Jatani block, Puri.

Group B: Territorial Division, Forest Department, Government of Orissa.

3. Balukhanda Reserved Forest C11, Puri sadar, Puri.
4. Balukhanda Reserved Forest C13, Puri sadar, Puri.

Group C: Orissa State Cashew Development Corporation.
5. Ranpur Cashew Plantation Project , Khurda, Puri.
6. Kadamjhola 3 Cashew Plantation Project, Khurda, Puri.

Group D: Industrial Plantation.
7. National Aluminium Company, Angul, Dhenkanal.
8. Ballarpur Industries Limited, Choudwar, Cuttack.

However, as far as other agents are concerned, viz., OFDC, Agriculture Department and Voluntary Organisations, they are left out of the study due to lack of data/information.

5.5 Method of Data Collection

As our study involves SBCA of various plantation schemes of different agencies, collecting relevant data from the concerned agencies and persons is quite challenging. Since our study needed secondary as well as primary data, we have collected secondary data/information from the files, reports of the authorities and also from the libraries. On the other hand, we gathered the primary data from the concerned field officials and the local people.

5.5.1 Secondary Data Collection

As a first step of our data collection, we have collected some basic information from the libraries of Bureau of Economics and Statistics, Orissa, Orissa University of Agriculture and Technology, Bhubaneswar and libraries of Central Government offices like Planning Commission, Ministry of Environment and Forests, Centre for Science and Environment, and other libraries of different institutes.

In the next step, we have visited all the head offices of our sample project organisations. For the plantation of territorial division, i.e. for Balukhanda C-11 and C-13, we have collected information from the PCCF, Orissa and from the Divisional Forest Office, Khurda. For social forestry projects, i.e. for Gopalpur and Mundal, data are collected from the Directorate of SFP, Bhubaneswar and from the Puri range office. For the plantation of Cashew Corporation, i.e. for Ranpur and Kadamjhola 3 projects data are

collected from the Orissa State Cashew Development Corporation and from the office of the Divisional Manager of Khurda. For industrial plantation, we have collected data from the horticulture department of NALCO and from the raw materials division of BILT.

5.5.2 Primary Data Collection

Since it was not possible on our part to obtain all the data from any particular source or place, we have made an attempt to collect comprehensive data from the primary sources by visiting the project sites. We have visited the village Gopalpur; the local forester and the Chairman of the VFC, who are the best persons to give the detailed data regarding the projects. The other factors like impact of the project on the social lives, economic lives and environment are gathered from the local people in the form of direct interview. Randomly we have discussed with the villagers who were available during our field visits. The same pattern have also been followed for Mundal VWL.

We have collected data/information regarding Balukhanda C-11 and C-13 from the Puri Range office. Afterwards we have visited the area in order to have first hand information. As far as expected benefit part is concerned, we have taken help from other sample projects provided by the authorities.

The third group of projects are from Cashew Corporation. As already mentioned we have collected data for Ranpur and Kadamjhola 3 project from the Divisional Manager Office, Khurda. In order to have first hand information regarding the project and to assess the maintenance cost we have visited personally both the project sites. The discussion with local people, and watchmen have been very much helpful in estimating costs and benefits

As far as NALCO and BILT plantations are concerned, the horticultural manager of NALCO and raw materials manager of BILT are the persons who have helped us in getting relevant data. They are the sources who have enriched us with their knowledge. The detailed figures like input requirement, expected benefits etc. have been gathered from the discussions with concerned officials.

Other data like yield rates, local prices of forest products(both minor forest products and timber), people's participation and their remarks for the project have been collected from the local people of sample project areas through direct enquiry by us. Even after tapping all these sources, when some data were still not available, we have resorted to estimate the figures by a method of approximation.

With these sample projects data we move on to the Social Benefit Cost analysis of those units, the very first step being financial analysis followed by economic analysis, which are elaborated earlier. In the last step we have attempted to estimate some of the externalities in order to give a complete picture of SBCA.

5.6 Estimation of Externalities

In the latest literature on project appraisal/evaluation, a movement from commercial to economic calculations involve the estimation of social benefits and social costs, which ought to be corrected by incorporation of the externalities into the estimation, i.e., the externalities are to be internalised into the system. And in order to quantify the externalities generally two approaches are adopted by the economists. Those are:

1. Qualitative Approach, and
2. Quantitative Approach.

5.6.1 The Qualitative Approach

Any qualitative assessment of benefits and costs, no doubt, involves the value judgements of the project evaluator because it encompasses the subjective pronouncements. Such qualitative assessment of external benefits may be divided into many categories. But the important among them are (i)Conventional Welfare Approach, (ii)Hedonic Approach and (iii)OECD Approach.

The Conventional Welfare Approach emphasises on qualitative assessment of externalities, which implies that economists should make an attempt to identify the side effects of a project in terms of a scale of better or worse. They should describe the phenomenon qualitatively. Its underlying principles are 'normative', which implies 'ought'

propositions that derive ultimately from the ethics of society. The older welfare traditions associated with "Cambridge" or Neo-Classical school of Marshall (1924), Pigou (1946), Lerner(1946) and Robertson (1962) and the Modern/New Welfare economists associated with the names of Vilfredo Pareto(1906), Hicks(1939), Little (1950), Samuelson(1950) and Graff(1957) have highlighted the qualitative aspects of measurement of externalities.

On the other hand, the "Hedonic Approach" is based on the assumptions that individuals adjust their behaviour according to the quality of some environmental good. This method examines the market in which goods are bought and sold and where environmental qualities are attributes of these goods. Such a price technique of Griliches(1971) to house prices has provided a method of evaluating the benefits of environmental improvements in urban areas However, the hedonic price schedule will only reflect households' marginal willingness to pay for a particular attribute if the major level of that attribute corresponds to that perceived by the consuming households. This is particularly relevant with respect to disamenities such as air pollution. From this qualitative approach there is an extension to quantitative approach which is known as hedonic property approach. It is based on the assumption that if different locations have different environmental attribute, there will be difference in property values. The approach attempts to (a)identify how much of a property value differential is due to a particular environmental difference between properties and (b)infer how much people are willing to pay for an improvement in the environmental quality and what is the social value of the improvement(Pearce and Markandya, 1989). This methodology was adopted by Brookshire, et al.(1982), Cummings, et. al (1983), and Brookshire et. al (1985) for evaluating air quality improvements, natural hazards etc.

But there are many statistical and methodological problems associated with this method. Statistical problem often exists because of a high correlation between some measure of environmental quality (such as, air pollution or noise) and some other variables such as neighbourhood variables and socio-economic variables (Kuik, et. al, 1992). The

method is limited in terms of completeness and comprehensiveness. At best it only estimates well-perceived environmental improvements at residential sites.

The authors of the OECD manual method of project evaluation that gained its popularity in the 1970s and 1980s in the world had realised the importance of externalities and justified to internalise the externalities. But they have failed to break the ice in terms of suggesting any viable alternative method to measure them in quantitative terms. According to the OECD manual "if the project analysers have a suspicion that there may be rather powerful external effects to an individual project, one way or the other then they should try to quantify them, however roughly". Sometimes there remains possibilities of strong external effects which defy any attempt and plausible quantification.

5.6.2 The Quantitative Approach

The technique of benefit-cost analysis(BCA) as well as the subsequent SBCA, which has gained its importance since 1960s, has gained popularity in terms of their applications in the decision-making processes. Specially the extension from BCA to SBCA calls for identification and quantification of "Externalities". It was rightly stated by Layard(1972) that Cost-Benefit Analysis is in part an attempt to include environmental cost and other externalities within a framework of a quantitative study. In undertaking the SBCA exercises, the project evaluators and economists have attempted to devise different methodologies in quantifying externalities. Some of the important methods are discussed below.

(1) Valuation From Behaviour

In order to value the recreational benefits of projects, attempts have been made to use this valuations from behaviour methods. This method was developed by Clawson(1959) and Mansfield(1971), whereby they had attempted to estimate the value of the English Lake District National park to the community of the country side. Under this method one has to know the excess of the total value which people put upon their visits over the costs they incur in making them. Thereby the demand curve for visits can be drawn. Mansfield fits a demand curve using these variables for each area from which

visitors come. For visitors from each area the surplus can be readily computed at the area under the demand curve. The total surplus is simply the sum of these surpluses.

However, there are many problems associated with this method. Particularly, it fails to include the price of substitute recreational facilities.

(2) **Human Capital Method(HCM)**

As we know that one of the most difficult item to be valued in quantitative terms is the human lives. Yet many scholars have attempted to quantify them. To cite one example, suppose that each worker on the bridge has a one percent probability of being killed on the job, and there are 25 workers. One approach is to cost the risk of loss of life at 25% times the average human capital value per worker. But this immediately raises the question of 'value to whom?'. Weisbrod(1961) distinguishes two measures, without committing himself to saying which is relevant to the public decisions. The first consists of the present(discounted) value of a man's future life time production, measured by his earnings. This measure implies that production is equally valuable, regardless of how many people are there to consume the fruits of it. Alternatively, he assumes that all that matters is consumption per living person, in which case the value of someone's life is measured by the effect of his death on the welfare of those who would survive him. This equals the excess of his expected future production over his future consumption again discounted to the present.

However, neither of these approach is very satisfactory. The former would, in most countries, support population policies which maximised the birth rate while the latter would support policies which minimised it. The alternative is the use of life insurance values, but this would only reflect the value of a person's life to each family and not to himself.

(3) **Travel Cost Method(TCM)**

The idea of the travel cost method(TCM) is to use the information on money and time that individuals spent in reaching to a recreational site, so as to estimate the hypothetical demand curve for that site. The area under this demand curve is the willingness to pay for

the facilities of that site. The TCM was adopted by Knetsch and Davis(1966), Bishop and Heberlin(1979). Desvousges, Smith and Mcgivney(1983).

However, this method is not free of practical and methodological problems. For its correct use, the method requires large quantities of data and is therefore expensive. If trips to the recreational sites are not made solely for the purpose of visiting that site, but for other purposes as well, then the cost in time and expenses have to be split up of between those purposes. This problem has not yet been tackled satisfactorily and remains a drawback of the method. Finally the method is restricted in both completeness and comprehensiveness. At best, it can only estimate recreational benefits of a particular site. It does not estimate option, existence or bequest values.

(4) Noise Number Index(NNI)

This method was used by the Roskill Commission in examining the economic viability of the Third London Airport with the help of BCA. The principle of valuation adopted by the Commission was to value the effects of the airport by reference to the value of those who would be directly affected by it . If the effect is beneficial , the value required is what the person affected would just be willing to pay for it ; if it is adverse the value required is that which he would just be willing to accept in compensation . If sum of the benefits exceeds the sum of the costs, it should be possible for the beneficiaries to compensate fully all those who have been made worse off while remaining better off themselves .

To measure the aircraft noise, the Commission used the Noise Number Index (NNI). This is an index which takes into account both the number of aircraft heard per day and the average loudness of the noise. It was derived from a social survey carried out by Mckonnell in the area around Heathrow ; loudness and duration of the noise and the number of aircraft were correlated with the subjective reactions of the people affected and NNI gave the best fit.

(5) NCAER Method

With a view to suggest a new methodology to assess the flood control benefits of river valley project, in 1964 the Ministry of Irrigation &Power had sponsored a study to

NCAER . In its turn the NCAER undertook some field investigations in the North Bihar region and submitted its report entitled. "Scientific Assessment of Flood damages" in 1968 . In addition to the direct benefits . the NCAER had suggested a means to quantify the externalities in the form of indirect flood damages .

(6) Flood Control Benefit Estimation Method of Rath

In his study "Social Benefit-Cost Analysis of the Rengali Multi-Purpose Project, Orissa", Binayak Rath (1980) had devised a new methodology of estimating the direct and indirect benefits of flood control of a multi-purpose river valley project in a comprehensive manner. He had conceptualised the externalities in the form of indirect flood control benefits, such as :

(a) additional agricultural operations in the flood-plain;

(b) increased land values in the flood-plain;

(c) extension of drinking water facilities in the vicinity of the river;

(d) extension of navigation facilities;

(e) additional fish and wildlife development; and

(f) saving of transportation and construction costs in the flood-plain .

By undertaking empirical verifications, he had developed the hypothesis that the spill over effects/externalities of a flood control project are much more prominent than the direct benefits. With the help of the quantified figures of direct and indirect flood control benefits, he had shown that over the years the rate of increase of the indirect benefits would be more than 10 times higher than the direct benefits . He had also shown that while in the initial phase of operation of the project the indirect benefits would be three times more of the direct benefits, at maturity stage the same would be thirteen times higher than that of the direct benefits .

(7) Contingent Valuation Method (CVM)

This method of Contingent Valuation Method was first adopted by Randall et al(1983). In this methodology one basically asks the affected people what are they willing to pay for a well-defined environmental benefit so as to estimate the shape of the

hypothetical demand curve. The basic assumptions of the method are:(1) individuals fully understand the options that are offered to them and that they are familiar with the environmental good in question and (2) that it can be relied upon that what people say is really what they would do if a market for the environmental good existed. In sociological terminology it is not their attitude we are interested in, but their intended behaviour.

In earlier years, CVM was often rejected because of the assumptions that people would have incentives to understate or overstate their true willingness to pay for a public good, depending upon whether or not they expect that they will be charged according to their answer. This bias is known as 'strategic bias'. In practice, however, both laboratory tests and CVM studies found little or no evidence for this bias. This method can capture option, existence and bequest values, where the other methods only capture the user values. Pearce and Markandya(1989) had concluded that the CVM has two important features: viz.

- it will frequently be the only method of benefit estimation;
- it should be applicable to most contacts of environmental policies.

(8) FRI Methodology

Since 1970s, the scientists of the Forest Research Institute(FRI), Dehra Dun had made commendable attempts to quantify externalities in the form of ecological benefits of forests. In their studies, O N Kaul(1973), H N Mathur et al(1976, 1980, and 1985), and T M Das(1980) had tried to quantify the economic gains resulting from ecological benefits of forests. They had monetised the following ecological benefits:

- Production of oxygen;
- Conservation of animal protein;
- Controlling of soil erosion and soil fertility;
- Recycling of water and controlling of humidity;
- Sheltering of birds, squirrels, insects and plants; and

- Controlling of air pollution.

Kaul had worked out ecological benefits in the form of organic productivity and calculated the per hectare benefit of tropical, sub-tropical and temperate forests as Rs.141.30lakh, Rs.126.74lakh, and Rs.94.20lakh respectively over a 50 years period. On the other hand, the FRI had estimated the ecological benefits of Chir, Sal and Teak plantation at the age of 50 years at New Forest Dehra Dun as Rs.24.40lakh, Rs.67.06lakh, and Rs.28.03lakh per hectare respectively. In the subsequent study Mathur(1985) has established that the ecological benefits would constitute 99.94% of the total benefits of a forestry project.

5.7 Application of SBCA in Our Study

To achieve our objectives of evaluating plantation projects, we have adopted the theoretical framework which is based on UNIDO Guidelines approach with few modifications. The reasoning behind the choice of this approach over other methods of evaluation are already discussed in section 5.3(v). Adhering to the UNIDO approach we have attempted to incorporate the following steps in our study:

(1) Calculation of financial profitability at market prices;

(2) Introduction of shadow prices of inputs and outputs to arrive at social costs and benefits;

(3) Adjustment for the project's impact on saving and investment;

(4) Adjustment for the project's impact on income distribution;

(5) Adjustment toward merit want promotion;

(6) Adjustment for the projects production or use of goods such as luxury consumer goods and basic needs whose social values are less than or greater than their economic values.

In tune with the first step in SBCA we have estimated the financial profitability of all the sample projects; the same analysis has been done by using the market prices. Since our sample projects have different base values, in order to ensure proper comparison we

have taken 1990-91 as standard base-year(reasoning discussed later in this chapter) for our analysis. All the prices are changed to the 1990-91 level with the help of whole sale price indices. Thus the financial profitability has been estimated at constant market prices. In order to account for the inter-temporal variations, we have discounted the net benefit streams with standard discount rates and have estimated the NPV, BCR, and IRR of the projects.

However, since market is not perfect, financial profitability is not sufficient; hence from step one we have moved to step two where we have estimated the shadow prices of different inputs like land, labour and capital. With these economic prices we have estimated the economic feasibility of the projects in terms of NPV, BCR and IRR at an economic discount rate of 11% as suggested in the literature, which is explained in sub section 5.7.2(iv).

The fourth step that concerns with the income distribution aspect implies that the projects should be selected in such a way that the inequality between poor and rich should decrease. Thus, the projects aiming towards upliftment of the socio-economic conditions of the down trodden class of people in the society should be given more weightages. This aspect has been incorporated in our study assigning due weight to the unskilled labour force through the shadow wage rate. In addition to the income distribution aspect shadow wage rate has taken care of saving investment part of the unskilled labour also.

The other aspect focused in the UNIDO Guidelines is the merit want promotion objective of planning . This aspect is taken care of by the weights used in estimating the shadow prices. The last aspect of luxury goods vs. basic goods could not be incorporated due to lack of data.

Furthermore, to establish the socio-economic viability of our plantation projects, it becomes necessary to quantify the externalities and place a value for them to commensurate with the numeraire of benefits and costs. In this regard some

studies(already discussed) have established that material benefits constitute a negligible proportion of the external benefits from the forestry projects. Though quantification of externalities is, no doubt, a difficult task, a few methodologies are available in the economic literature which are also discussed earlier.

As discussed earlier, since forestry is an area which has a lot of positive externalities, the socio-economic evaluation including environmental aspects is a great task. With a view to main streaming some of those externalities, an attempt has been made by us in two steps.

In the first step, we have tried to calculate the fuel and fodder benefits of plantation projects, which are not generally not marketed, by applying the Contingent Valuation Method(CVM)[18]. To accomplish this objective we have interviewed the beneficiaries directly and elicited the information on what are they willing to pay for the extra fuel they receive from the plantation project. But, the basic assumptions of the CVM methods are (1) individuals fully understand the options that are offered to them and that they are familiar with the good in question, and (2) that it can be relied upon that what people say is really what they would do if a market for the good existed. In this way we have collected the data on the amount of fuel and fodder produced by the project. As far as willingness to pay is concerned, people have generally answered the market price as their willingness to pay. Taking into account these factors we have estimated these external benefits.

As far as ecological benefits are concerned which are, no doubt, associated with our sample projects, we are unable to estimate them as our analysis is based on one-time field survey. As argued in the literature in order to assess the environmental impacts of a project, one has to collect data of different parameters over a long period which is of course time consuming and expensive. Moreover, with inadequacy of scientific knowledge, it will not be proper to quantify those benefits. Simultaneously, it is well

[18] CVM will frequently be the only method of external benefit estimation(Pearce and Markandya,1984)

argued by environmentalists that without those ecological benefits the socio-economic study will also be incomplete. Hence, we have adopted the estimates of Rath's(1997) study for our estimation. However, the value of these estimates are applied with proper adjustments(which are discussed later in this chapter).

Thus, our approach is an extension of UNIDO Guidelines where we have emphasised the estimation of externalities. The detail procedures are discussed below.

5.7.1 Method of Financial Analysis of the Projects

The first stage of the sequence of our analysis is drawn with reference to the data provided by the project authorities. Of course, at few places we have introduced our own estimates of benefits and costs and other approximations to overcome the problem of non-availability of data. This exercise which is termed as financial analysis, has been undertaken at the current market prices of the inputs and outputs. However, to commensurate comparison we have changed all current prices to constant prices with the base 1990-91. The year 1990-91 is chosen as base year because of the fact that while few projects have started in 1990s, few in 1980s; those which have started in 1980s have been giving benefits in 90s and those which have started in 90s will give benefits at the end of this century and few will continue to the first quarter of next century. With the all India Wholesale Price Indices(WPI) the market prices which are before 1990-91 have been inflated to 1990-91 and those which are after 1990-91 have been deflated to 1990-91.

The formula used for inflation/deflation is

$$\frac{Price..Index.of..1990-91}{Price..Index.of.Current..Year} \times Rupees..Value.of..Current..Year$$

The price indices are collected from different issues of Economic Survey of Government of India. After changing the prices into 1990-91 level, the financial net benefits are estimated. However, this estimation has not considered the time factor. In order to account for the inter-temporal time preference the financial net benefit stream is discounted in different rates of discount. Though the standard rate of discount for public sector projects in India ranges between 8 to 12%, we have discounted with low rates of discount because it is already advocated in the literature that forestry sector projects

should be discounted with low rates of discount in order to give preference to future generation. Hence, we have discounted with 2%, 5%, 10% and 12% rates. With the discounted cash-flow we have the NPV, BCR and IRR.

5.7.2 Methods of Economic Analysis of the Projects

The financial analysis carried out above has not taken into considerations the effects on the whole economy. Economic evaluation is concerned with the efficiency with which projects create net utility as measured by willingness to pay for benefits and willingness to accept compensation for benefits foregone (Mishan, 1975). To correct the distortions arising from market imperfections, the market prices for factors of production are replaced by shadow prices which measure the foregone value of their alternative potential production i.e. opportunity cost. Shadow prices for correcting market deficiencies are also referred to as economic or efficiency prices and are based on the growth strategy of economic development. The economic prices or the real values of the factors of production i.e., land, labour and capital can be estimated in terms of the foregone marginal productivity based on the principle of opportunity cost. We would like to discuss those briefly as follows.

(i) Marginal Productivity of Land

Marginal productivity of land represents the opportunity cost in terms of alternative products foregone from the land used for forestry. Since the alternative productive use of land is agricultural production, the marginal productivity of land can be measured in terms of the agricultural production per unit of land foregone. However, most of the lands used for plantations are either not fit for agricultural production or are marginal land. Consequently, the marginal productivity of land used for plantations is almost nil[19]. Some of the lands particularly grazing land may carry certain opportunity cost which, however, is not lost even after plantations. Therefore, the economic cost of the land in the present exercise has been assumed to be zero for projects other than industrial plantations. In the industrial plantations, particularly Ballarpur Industries Ltd has purchased land from

[19] Das, M.C.91982), "Social Forestry Project, Orissa State", for World Bank assistance, Forest Department, Orissa.

farmers to raise plantations for its own raw materials. Since that land was being used for different purposes, in that case we have estimated the opportunity cost of the same.

(ii) Marginal Productivity of Labour

With respect to the valuation of the labour inputs of the project we have applied the shadow prices to the unskilled labour only. In case of skilled labour, it is noted that normally such labour is drawn from similar occupations in which, more or less, the same remuneration is paid as is provided by the project. This category of labour is also in short supply in a backward economy like Orissa. Thus, it is reasonable to assume that the skilled labour is being paid a competitive wage which reflects fairly well their marginal productivity(i.e. the opportunity cost) and as such, their economic value. So there is no need to introduce any adjustment for the wages and salaries of the skilled labour. However, the same is not true of the unskilled labour who are usually drawn from the agricultural sector and generally get a wage in the project which is higher than their marginal productivity. Therefore, the market wage does not represent the economic value of unskilled labour. This implies that in calculating the economic costs of the project, there is a need to bring adjustments to the market wage rates of these labour on the basis of the shadow wage rate.

The marginal productivity of labour, one of the major component of Shadow Wage Rate(SWR) for labour, is one parameter in the project analysis for which a national value is not sufficient. There will, in fact, be a large number of economic wage rates for the country given constraints to labour mobility, regional variations in labour productivity and differing employment, unemployment patterns etc. SWR represents the loss of productivity in the alternative employment. Since for majority of rural labour force, agriculture is the main source of employment, the output foregone would be in terms of agricultural production.

In the UNIDO Guidelines framework, the formula used for estimation of shadow wage rate is: $W^* = m + s_c(P_i - 1)W - vW$

where W* = shadow price or economic price of unskilled labour i.e. shadow wage rate;

m= direct opportunity cost of labour;

Sc = MPS or marginal propensity to save of the capitalist;

Pi = shadow price of investment;

W = wage rate prevailing in the project; and

v = redistributional premium for labour's consumption.

This W* is already estimated by Rath(1980)[20] as 0.57W(W is the market wage rate) for unskilled labour of one multi purpose dam of Orissa. Another study by Sharma(1991) shows that the SWR for unskilled labour employed in social forestry projects of Orissa is 0.33W. Since our study is confined to plantation projects of Orissa, we have taken the average of these two estimates, i.e. our study has used a SWR of 0.4W. This SWR reflects the economic efficiency of labour, impact of employment on savings and consumption and the equity of income distribution. Of course, this rate of SWR is relatively less than that of estimated by economist like Kumar(1988) who estimated EWR for Karnataka as 0.47W, Mishra and Beyer[21](1978) estimated for Maharashtra as 0.46W for male labour and 0.65W for female labour. A low value for Orissa is due to high rate of unemployment and underemployment in the area.

(iii) Economic/ Shadow Prices of Basic Inputs

With regard to the shadow prices of basic inputs like fertiliser and saplings, it is argued that the appropriate basis for determining the shadow prices of these inputs should be the cost of production of these items provided these commodities are produced under competitive conditions. But the paucity of data to this effect has compelled us to use the market prices with some weightage as the first approximation of the shadow prices of the same. In our society subsidy is regarded as one kind of weight. The subsidy for saplings in plantation is generally 40% while the subsidy in fertiliser is 30% in Orissa. Thus, the average of these two i.e. 35% is taken as weight for shadow prices of inputs. However,

[20] Rath, B.(1980). "Social Benefit-Cost Analysis of the Rengali Multi-Purpose Project, Orissa", Unpublished Ph D Dissertation, IIT, Kanpur.

[21] Mishra, S.N. and Beyer, J.(1978), "Cost-Benefit Analysis-A Case Study", Institute of Economic Growth.

for those cases where the saplings are produced by the agents on their own, i.e. there is no subsidy, we have only adjusted the fertiliser part.

(iv) Economic Discount Rate

It is well argued in the literature that the discount rate used in economic analysis(referred to as Economic Discount Rate, EDR) is derived from marginal productivity of capital in the public sector which, as a measure of the opportunity cost of capital(i.e. economic price of capital), reflects the rate of return to government investments. As regards to value in India, the Planning Commission, Government of India was previously using 10% for the evaluation of the projects in the public sector which was later revised to 12%. While Messers Mishra and Beyer have estimated the range between 8% to 10% in their study, Dasgupta has recommended in the range of 8% to 12%. However, of late, Sharma and McGregor(1991) have estimated the value of EDR as 11% based on an estimation of dynamic production function. Hence, in our economic evaluation of plantation projects EDR is taken as 11%.

(v) Economic/ Shadow Prices of Outputs

The economic value of outputs is estimated from the willingness to pay price. The products of our plantations are of different varieties- while some projects produce timber with fuel and fodder, other projects produce fruits along with timber, fuel and fodder. Generally the financial value of timber and cashew is the auction price as the products are being auctioned away after the harvest. However, it is seen that the auction price is less than the market price. In the economic evaluation we have assumed the market price as the willingness to pay price. From the primary data collection it is seen that the market/retail price of timber(eucalyptus, casuarina) is generally 1.2 times the auction rate[22]. Hence in the economic estimation we have revalued the timber benefits accordingly. On the other hand, the market retail price of raw cashew(Rs.30 to Rs.35 per kg) is almost 1.5 times the auction price(Rs.20 to Rs.25 per kg). Hence the economic value is taken as 1.5 times the auction value.

[22] When market price is Rs.220/ per quintal, auction price is Rs.180/ per quintal.

With these adjustments we have estimated the economic/social cost and economic benefit.

5.7.3 Socio- Economic Analysis

In the economic analysis, while some aspects relating to market imperfections are accounted, in the social analysis the externalities of forestry projects are considered. In the production, distribution and consumption of certain goods, there are either beneficial or harmful side effects borne by the people not involved in the transactional exchange. These side-effects of economic activities are termed as externalities. In the socio-economic analysis we try to include those externalities as far as possible.

To include the externalities or indirect benefits we have estimated the values of fuel and fodder. The fallen leaves and twigs from the trees are generally used for fuel purpose by the poorest section of the village. To estimate this benefit we have adopted the contingent valuation method which is the most practical method of estimating externality. Following discussions and by canvassing questionnaire we have collected the data regarding quantity of fuel availability, its market price and the villagers willingness to pay for those fuel. From 5 hectares of plantations from 4^{th} year onwards availability of quantity of fuel is collected through the CVM; every alternate day people collect 10kg of leaves which increases to 15 kg in 5^{th} year which later increases to 20 kg from 6^{th} year onwards; the willingness-to pay price is Rs.0.60 per kg in 1990-91. Moreover, people collect fuel around 10 months of a year. With these information we have estimated the amount of fuel benefit for the plantation projects.

On the other hand, within two years of plantation generally grasses start coming up in the area which was barren before the plantation. These grasses are being used as fodder purposes. In order to estimate this indirect benefits we have adopted the net resources saved concept. That means, in the absence of these grasses how much amount people must have spent for fodder purpose. From these two estimates we have included the fuel and fodder benefit of plantation projects.

It is also argued in the literature that to account for the inter-temporal variations, the socio-economic cash-flows have to be discounted with the social rate of discount.

Social Rate of Discount(SRD)

The SRD is an important parameter to find out the social profitability of a project. It is defined as the marginal rate of substitution at which the weight on the consumption falls over time. According to Colin Price(1989). "the discount rate of Social BCA is the rate of decline in the value of the numeraire over time". Since the life of a project stretches into the future, the costs will be incurred and benefits received at different points of time. It is well argued by economists that the value of benefits and costs are likely to differ in different time periods owing to inter-temporal time preferences. A unit value of benefit or cost is not identical in different periods due to the inter-temporal effects. This gives rise to the problem of reducing the benefits and costs to a particular base year and to make them commensurate with each other. If one has to add up the benefits and costs, then he must have some rule for assigning weights according to the time of occurrence. Under the circumstance, the social rate of discount(SRD) is the appropriate divisor or tool for making the benefits and costs commensurable. Thus, SRD is defined as the rate at which the weight on aggregate consumption declines over time. This represents the collective social time preferences about present and future consumption.

We have already discussed earlier that discount rate used in forestry projects should be in the lower range of 2-3%. In this regard Sharma et al (1991) had advocated the SRD for land-use projects in India as 2% based on an inter-temporal social utility model. Kula(1992) and Price(1989) have also argued that the forestry schemes should be accorded a social discount rate of around 2%. Based on these arguments, in our socio-economic evaluation of all plantation projects we have used a SRD of 2%.

We have already stated that in the socio-economic evaluation, externalities to the price mechanism are being accounted for. Environmental impact of any project being one

major externality, we have estimated those following Rath et al(1997) which has been based on few studies done by scientists of Indian Forest Research Institute, Dehradun. Of course we have applied in our study with proper adjustments.

In the study "Forest and Environment-An Economic Appraisal of Ecological Benefits" H.N.Mathur[23] has estimated ecological benefits in the form of organic productivity and calculated the per hectare benefit of sub-tropical forest as Rs.126.74lakh over a 50 year period. The detailed estimates are shown in Table 5.2. Similarly there are two other studies viz. Kaul's study and Das's study. Both have estimated the ecological benefits in terms of improvement in soil fertility and control of soil erosion from a medium size tree of 50 tonnes weight for a period of 50 years. However, as expressed by Rath(1997) in all these studies the benefits due to controlling soil erosion and soil fertility seems to be overestimated. Hence he has estimated the additional agricultural productivity taking a case study from Orissa. Based on those three studies he has shown three estimations and out of those we have taken the minimum one as other two results appear to be overestimated. The minimum one which is based on Mathur's study shows that the total ecological benefits from one hectare of plantation per annum is Rs.45,760/ (in 1985-86 prices).

Table 5.2: Value of Ecological Benefits Derived From Sub-tropical Forest For a 50 Year Period

(Rs in Lakhs)

Ecological Benefits	Sub-Tropical Forest
Production of oxygen	20.5
Conversion to animal protein	1.6
Controlling of soil erosion and soil fertility	2.5
Recycling of water and controlling of humidity	24.6
Sheltering of birds	20.5
Controlling of air pollution	41.0
Total benefits in 50 years	126.7
Average annual benefits per hectare	2.53

Source:Mathur, H.N.(1985), "Forest and Environment-An Economic Appraisal of Ecological Benefits", proceedings of National Seminar on Forest & Environment, IFRI, Dehradun

Since our study is based on 1990-91 prices, we have inflated the amount to get the per hectare per annum ecological benefits in 1990-91 prices, which has been Rs.56,880/. However, while estimating the ecological benefits of different plantation schemes we have differentiated on the basis of survival rate of the trees. Since the survival rate differs from project to project, and naturally the number of surviving trees also differ and so also the ecological benefits. But in this regard a point may be noted that in our estimation we have included these ecological benefits from 4th year of operation of the programmes. The reasoning behind this is that the ecological benefits would flow only after a certain growth of the plants. These ecological benefits are being added to the socio-economic net benefits resulting in socio-eco-environmental benefits.

Thus, the steps followed for the SBCA of plantation projects in our study are as follows:

(A) First, we have estimated the Financial Net Benefit(Financial Benefit-Financial Cost) i.e. at constant market prices ;

(B) Second, we have estimated the Economic Net Benefit(Economic Benefits-Economic Cost) after adjusting the market prices with economic prices.

(C) Third, we have estimated the Socio-Economic Net Benefits i.e. including indirect benefits(in the form of fuel and fodder) to the economic net benefits.

(D) Fourth, we have estimated the Socio-Eco-Environmental Net Benefits i.e. including environmental benefits to the socio-economic net benefits.

All these Net Benefit streams are then discounted at different rates of discount to get the NPV and BCR of the projects. In addition to these at each step the IRRs of the projects are also estimated. As literature shows the NPV is preferable compared to others for decision making; however, in our study, to compare the projects we felt this is not sufficient as there is a wide gap in the area of the projects. Hence another criterion based on NPV i.e. NPV per hectare is estimated in each case and on that basis we have drawn our conclusion. At the end some policy implication of the study are discussed.

Chapter 6

SBCA OF PLANTATION PROJECTS: CASE STUDIES OF SOCIAL FORESTRY PROJECTS, ORISSA

6.0 Introduction

In the last chapter we have discussed the four types of plantation projects those are selected for our study, viz. plantations by Social Forestry Division and Territorial Division of Forest Department of Government of Orissa, plantation by Cashew Development Corporation, and by two Industries. As discussed earlier the Social Forestry Project(SFP) activity is implemented by the Government agency with the help of local people. The Phase I of the project was launched in 1983 in nine selected districts of Orissa at an initial cost of Rs.230 million over a period of 5 years. The project was aimed to serve the basic needs of the people in respect of fuel wood, small timber, fodder and minor forest produce. It was further aimed to cover 5,000 villages in forestry production programmes and to assist the rural communities in establishing 21,700 ha. of Village Wood Lot(VWL). Gopalpur VWL and Mundal VWL in the district of Puri are two such projects.

In the present chapter, we propose to undertake a detailed social benefit-cost analysis(SBCA) of the SFP at Gopalpur as well as Mundal which are sample units from Puri district of Orissa. After presenting a brief history of the projects and their programme of plantation, we have undertaken the financial analysis to establish the commercial viability and then extended the analysis in terms of an economic viability and finally we have incorporated externalities in order to complete the SBCA.

CASE STUDY 1: **EVALUATION OF GOPALPUR SFP**

6.1 Brief History of GOPALPUR SFP

There was a patch of community land in Gopalpur of Puri sadar block of Puri district which was being used for cultivation of paddy by the people at random intervals. Since it was low lying and sub mergible area, the production had been sub-marginal. In 1984 when

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the message of Social Forestry reached the village, the villagers thought it wise to utilise the land for plantation with dual purposes, viz.,

- to reduce swampiness of the area, and
- to get better returns from that land.

In view of the interest of the villagers a plantation project was started in Gopalpur in 1985 over 5 hectares of land under the Village Wood Lot(VWL) scheme and it was executed by the Social Forestry Range, Puri. Under the guidance of forest officials, at first instance, 10,500 plants of four varieties, viz. Casuarina, Eucalyptus, Cashew and Polang, were being planted. The survival rate was nearly 80%. With the assistance of Social Forester of the Puri Range, a Village Forest Committee(VFC) was being constituted with a Chairman from among the villagers and five committee members. It is the VFC who is in charge of the project and after discussion with other members it takes decisions regarding the project. After the maturity of three varieties of plants i.e. casuarina, eucalyptus and polang(which were mainly used for fuel), it was the VFC with the assistance from officials decided to harvest the trees.

As per the survey undertaken in 1995, finally, there were 2,533 existing plants after the 10 year cycle. Except the fruit bearing trees other trees were harvested. After the harvest, the benefits in the form of proceeds were used in these ways: (a) the timber lots were auctioned for cash proceeds and the proceeds went to the VFC; (b) the leaves and small timbers were kept for the fire wood purposes; (c)1,000 seedlings were purchased from the proceed to regenerate woodlots in the area; (d) the rest amount was being used for developmental purposes of the village. Half of the proceeds were kept in the Gramya bank in the name of Village Development Fund. As a result of this large amount of saving, they were entitled to get IRDP loan from that bank. The other half was used for the construction of one village temple, one common room for all villagers meeting purpose and one school building.

The second cycle has started in 1995-96 with active involvement of the people. Accordingly, the villagers have purchased the seedlings and replanted the entire area. But the cashew trees are there as its life span is 40 years. So again after 10 years the other trees will be harvested and once more the plantations will be developed. All these processes will come to an end in 2024-25 only when the cashew plants will mature and then will not give anymore fruits. Thus, the project is expected to continue till 2024-25 and people will get benefit from three sources and those are fuel, fodder and harvest. The harvest is again divided into two parts and those are cashew from 5th year onwards and at the end of each cycle the timber benefits. Moreover, at the end of 40 year period the other trees along with the cashew trees will be felled and can be used as timber benefits.

However, since our objective has been to analyse the commercial, economic and social viability of the project through the technique of SBCA, it is imperative to draw the profiles of costs and benefits of the project.

6.2 Costs of the Gopalpur SFP

To accomplish the objective, we need to estimate the costs and benefits flow of the project. As far as the commercial cost part is concerned we have taken the data provided by Directorate of Social Forestry Projects, Orissa which has fixed per unit(hectare)cost for different schemes like Village WoodLot(VWL), Reforestation of degraded forests, Institutional plantation etc. However, no data were available on particular project basis. As our concern was with VWL, we would like to discuss the costs for VWL in the next paragraph.

(A)Per Hectare Cost of VWL

The costs of any plantation project comprise of fixed costs and variable costs. The capital cost of the project is the land cost. However, the land used for SFP are mostly government/community land which are very poor in quality. In those cases the land cost is assumed to be zero as there is no payment made for the land. This is also true for Gopalpur VWL, i.e. the land cost component is assumed to be zero.

The variable costs of the project are labour cost, material cost, and maintenance cost. As reported in the SF Handbook for Orissa and also as per our primary information, VWL plantation schemes involve monetary costs from the beginning till fourth year of commencement. The detailed cost figures are shown in Table 6.1.

Table 6.1: Cost Estimates for VWL per Hectare

(Figures in Rupees)

Description of Costs	Labour Cost	Material Cost
A.Pre-Planting Year(Year 1)		
(a)survey & demarcation, clearance of site, burning of debris, alignment and staking, digging of pits	1350	
(b)cost of stakes, and ropes		5
(c)cost of implements		45
(B)Planting Activities(Year2)		
(a)carriage of seedlings from nursery to site, scooping of pits, planting operation, intensive soil work, grass cutting & weeding	1050	
(b)cost of fertiliser(125kg); cost of insecticide (12.5kg)		470
C.Post-Planting Activities(Year3)		
(a)soil works, and weeding	550	
(b)cost of fertiliser(75kg); cost of insecticide(2.5kg)		230
(D)Post-Planting Activities(Year4)		
deep soil working, weeding, and pruning	300	
Total	**3250**	**750**

Source: Social Forestry Handbook for Orissa.

It is evident from Table 6.1 that for one hectare of VWL plantation, Rs.1,350 of labour cost are required for pre-plantation activities like survey and demarcation, clearance of site, burning of debris etc. In the second year Rs.1,050/ of labour cost are required for carriage of seedlings from nursery to site, scooping of pits, planting operation, intensive soil work, grass cutting and weeding. In the third year Rs.550/ of labour cost are required for post-plantation activities like replacement of casualty, soil working and weeding. In the 4th year Rs.300/ of labour cost are required for deep soil working, weeding, and pruning, etc.

In addition to these labour costs, the project involves material cost till third year of operation. As shown in Table 6.1, in the first year, the material cost is given to be Rs.50/.

It includes cost of stakes, ropes(Rs.5/) and cost of implements(Rs.45/). In the second year of operation, the material cost is Rs.470/ which includes cost of fertiliser(125kg) and insecticide(12.5kg). In the third year the material cost is Rs.230/ which includes cost of fertiliser(75kg) and cost of insecticide(2.5kg). All these labour and material costs are in 1983-84 prices that is the year when the SFPs started in Orissa.

As far as maintenance is concerned, it is very negligible for SFPs as the maintenance as well as watch and ward is undertaken by the local people voluntarily. Thus, in total, for one hectare of plantation, Rs.3250/ of labour cost and Rs.750/ of materials are needed. These general costs estimate norms have been used by us to estimate the cost figures for Gopalpur VWL.

(B)Costs Incurred by Gopalpur SFP

It is already reported earlier that the area of Gopalpur VWL is 5 hectares. Accordingly we have estimated the labour costs and material costs over the life span. However, Gopalpur VWL is a typical project with the life span of 40 years within which there are four cycles of operation. The project started in the year 1985-86; the first cycle has been completed in 1994-95; the second cycle has started in 1995-96 and will be over by 2004-05; the third cycle is expected to start in 2005-06 and the fourth cycle is expected to start in 2015 which will be ended in 2024-25 and then the project will be terminated. The costs of operation of the project over the four cycles are shown in the Table 6.2. At present, the second cycle is in operation and two more cycles are yet to operate. We have assumed the same costs to be incurred in all the cycles.

6.3 Benefits of Gopalpur SFP

As far as benefits are concerned, the annual direct benefits are being received from cashew and the other trees provide direct benefits after felling, which are being used for fuel purpose. From 5th year onwards the cashew nuts have been harvested. The local price of cashew was Rs.20/ (at 1994-95 prices)as per the primary data and we have estimated the total amount of future production as per local people's experience. According to their calculations, one tree at the peak of its life span would give 2-3 kg of cashew nuts. With

these primary information we have estimated the financial benefit from cashew which are shown in Table 6.2.

Besides cashew, other financial benefits are received from timber. After the completion of one cycle, the matured trees were being felled and the timber were already sold. As the official report shows after the first cycle i.e., at the end of 1994-95, an amount of Rs.4,10,000/ was being received from the timber. We have assumed the same amount of timber to be harvested after each cycle. All these harvest figures are shown in Table 6.2. However, these financial benefits are in 1994-95 prices. At the end of the project, i.e. after 40 years cashew trees along with other trees are to be felled. Accordingly, we have estimated that an amount of Rs.4,20,000/ would be received from timber at the end of 2024-25.

6.4 Financial Analysis of the Project

As discussed in the methodology chapter, the first step of SBCA being the financial analysis which is done at market prices, we have calculated the net benefits of the project from the financial cash-flow which is shown in Table 6.2. While the total benefits are estimated to be Rs.17,22,000/, the total cost is Rs.80,000/. Hence the net benefit is Rs.16,42,000/ which shows the project is quite viable.

For comparative purpose, however, we have adjusted all prices into one base year. For our study we have chosen 1990-91 as base year(the reason being discussed in Chap5). That means the prices which are before 1990-91 have to be inflated to 1990-91 level and those which are after 1990-91 level have to be deflated to 1990-91 level. The formula used for inflation/deflation is:

$$\frac{Price.Index.of.1990-91}{Price.Index.of.Current.Year} \times Rupees..Value.of.Current.Year$$

For the project under consideration, i.e. Gopalpur SFP, the cost figures are in 1983-84 prices; and the cashew harvests and timber harvests are in 1994-95 prices. Hence while we have inflated the costs to 1990-91 prices, the cashew and timber harvests are deflated. The price indices are collected from different issues of Economic Survey of Government of India.

Table 6.2: Financial and Economic Estimates of Gopalpur SFP

(I) (Figures in thousand rupees)

	1985-86	86-87	87-88	88-89	89-92	92-94	94-95	95-96	96-97
A.COST									
Labour	6.75 (2.7)	5.25 (2.1)	2.75 (1.1)	1.5 (0.6)	--	--	--	6.75 (2.7)	5.25 (2.1)
Material	0.25 (0.337)	2.35 (3.172)	1.15 (1.552)	--	--	--	--	0.25 (0.337)	2.35 (3.172)
Total Cost (83-84)	7 (3.037)	7.6 (5.272)	3.9 (2.652)	1.5 (0.6)	--	--	--	7 (3.037)	7.6 (5.272)
Total Cost (90-91)	11.73 (5.094)	12.74 (8.842)	6.54 (4.448)	2.51 (1.006)	--	--	--	11.73 (5.094)	12.74 (8.842)
B.BENEFITS									
Fruits	--	--	--	--	0.5 (0.6)	1.0 (1.2)	2.0 (2.4)	2.0 (2.4)	2.0 (2.4)
Timber	--	--	--	--	--	--	410 (492)	--	--
TB(94-95)	--	--	--	--	0.5 (0.6)	1.0 (1.2)	412 (494.4)	2.0 (2.4)	2.0 (2.4)
TB(90-91)	--	--	--	--	0.332 (0.399)	0.665 (0.798)	273.9 (328.7)	1.33 (1.59)	1.33 (1.59)
(c)Net Benefit(90-91)	-11.73 (-5.09)	-12.74 (-8.84)	-6.54 (-4.44)	-2.51 (-1.006)	0.332 (0.399)	0.665 (0.798)	273.9 (328.7)	-10.40 (-3.49)	-11.41 (-7.24)

cont.

(II)

	97-98	98-99	99-04	04-05	05-06	06-07	07-08	08-09	09-10	10-13
A.COST										
Labour	2.75 (1.1)	1.5 (0.6)	--	--	6.75 (2.7)	5.25 (2.1)	2.75 (1.1)	1.5 (0.6)	--	--
Material	1.15 (1.552)	--	--	--	0.25 (0.337)	2.35 (3.172)	1.15 (1.552)	--	--	--
TC(83-84)	3.9 (2.652)	1.5 (0.6)	--	--	7 (3.037)	7.6 (5.272)	3.9 (2.652)	1.5 (0.6)	--	--
TC(90-91)	6.54 (4.448)	2.51 (1.006)	--	--	11.73 (5.094)	12.74 (8.842)	6.54 (4.448)	2.51 (1.006)	--	--
B.BENEFITS										
Fruits	2.5 (3)	2.5 (3)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	2.5 (3)
Timber	--	--	--	410 (492)	--	--	--	--	--	--
TB(94-95)	2.5 (3)	2.5 (3)	3 (3.6)	413 (495.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	2.5 (3)
TB(90-91)	1.66 (1.99)	1.66 (1.99)	1.99 (2.39)	274 (329)	1.99 (2.39)	1.99 (2.39)	1.99 (2.39)	1.99 (2.39)	1.99 (2.39)	1.66 (1.99)
(c)Net Benefi(90-91)	-4.87 (-2.45)	-0.85 (0.98)	1.99 (2.39)	274 (329)	-9.74 (-2.7)	-10.75 (-6.44)	-4.54 (-2.05)	-0.52 (1.38)	1.99 (2.39)	1.66 (1.99)

cont

(III).

	13-14	14-15	15-16	16-17	17-18	18-19	19-21	21-23	23-24	24-25	Total
A.COST											
Labour	–	–	6.75 (2.7)	5.25 (2.1)	2.75 (1.1)	1.5 (0.6)	–	–	–	–	65 (26)
Material	–	–	0.25 (0.337)	2.35 (3.172)	1.15 (1.552)	–	–	–	–	–	15 (20.25)
TC(83-84)	–	–	7 (3.037)	7.6 (5.272)	3.9 (2.652)	1.5 (0.6)	–	–	–	–	80 (46.25)
TC(90-91)	–	–	11.73 (5.094)	12.74 (8.842)	6.54 (4.448)	2.51 (1.006)	–	–	–	–	134 (77.56)
B.BENEFIT											
Fruits	2 (2.4)	2 (2.4)	2 (2.4)	2 (2.4)	2 (2.4)	1.5 (1.8)	1.5 (1.8)	1 (1.2)	0.5 (0.6)	–	72 (86.4)
Timber	–	410 (492)	–	–	–	–	–	–	–	420	1650 (1980)
TB(94-95)	2 (2.4)	412 (494.4)	2 (2.4)	2 (2.4)	2 (2.4)	1.5 (1.8)	1.5 (1.8)	1 (1.2)	0.5 (0.6)	420 (504)	1722 (2066)
TB(90-91)	1.33 (1.59)	274 (328.7)	1.33 (1.59)	1.33 (1.59)	1.33 (1.59)	0.99 (1.19)	0.99 (1.19)	0.665 (0.798)	0.332 (0.399)	279 (335)	1145 (1374)
(c)Net Benefit(90-91)	1.33 (1.59)	274 (328.7)	-10.40 (-3.49)	-11.41 (-7.24)	-5.21 (-3.25)	-1.51 (0.191)	0.99 (1.19)	0.665 (0.798)	0.332 (0.399)	279 (335)	1011 (1296)

Note: (1) The figures in the parenthesis show the economic estimates.
(2) TC implies total cost; TB implies total benefit.

After changing all prices into 1990-91 level, total financial benefits are Rs.11,45,130/ while the total financial costs are estimated to be Rs.1,34,160/. Hence the net benefit is calculated in a cruder form i.e. total benefits- total costs, which counts to Rs.10,10,970/. But in these calculations we have ignored the inter-temporal variations. In order to account for the same we have discounted the B's and C's with different rates of discount in the range of 2-12%. It is already discussed that for our SBCA, the Net Present Value(NPV), the Internal Rate of Return(IRR) and the Benefit-Cost Ratio(BCR) are being taken as evaluation criteria. Using the discounted cash-flow method we have attempted to estimate NPV, BCR and IRR which are presented below.

The NPV, BCR and IRR Estimates of Gopalpur SFP

The NPV estimates are the most commonly used estimates of measuring the commercial and social feasibility of any project. The decision algorithm associated with the NPV estimates is that accept the project when the NPV is positive and reject it when the NPV is negative. But the NPV estimates would, no doubt, vary with variations in the calculation of benefits and costs under various conditions.

Like the NPV estimates, the BCR estimates are, no doubt, the most widely accepted investment criteria for measuring the worthiness of a project. However, there is a close correspondence between these two estimates, i.e., if the NPV is positive, BCR will be greater than one and if NPV is less than zero, BCR will be less than one. The third criteria of evaluation is IRR. The decision making algorithm associated with the IRR is that if the IRR is greater than the market rate of interest, then the project is accepted or else it is rejected.

In order to examine the financial viability of the Gopalpur VWL, we have undertaken the calculation of NPV, and BCR at different rates of discount(such as 0%, 2%, 5%, and 10% and 12%) which are presented in Table 6.3.

The NPV estimates of the plantation project at Gopalpur show that with different discount rates ranging from 0 to 12% the NPV always works out to be positive, which implies that the project is commercially viable. At 10% rate of discount the NPV is Rs.1,31,000 and at 12% it is Rs.95,000/. Since the official rate of discount varies between

Table 6.3: The NPV, BCR and IRR Estimates of Gopalpur SFP (in terms of Financial consideration)

Rate of Discount	NPV	BCR	IRR
0	1011	8.53	30%
2	617	7.28	
5	323	5.77	
10	131	3.95	
12	95	3.41	

Note: Rate of discount and IRR in percentages: NPV in thousand rupees: BCR in number.

10% and 12%, the project is viable in terms of the NPV estimates The BCR is also high at all those rates of discount. At 10% rate the BCR is 3.95, and at 12% the ratio has become 3.41. The IRR is estimated to be 30% which is more than market rate of interest. It is to be noted that our result is in line with other studies. Madan Mohan Pant[1] has indicated a financial IRR in the range of 7-75% in some of the case studies carried out by him. Another study by Kanchan Chopra[2] on Rajasthan Social Forestry Project also showed that the financial IRR lie between 8.75-70%. Hence our estimates show that the Gopalpur VWL is financially viable.

After having investigated into the financial viability of the project, one must examine the project from economic point of view as the financial analysis does not give a real picture in an imperfect economy.

6.5 Economic Evaluation of the Project

As we have already discussed in chapter 5, economic evaluation is necessary in order to take care of market distortions. The factors which are adjusted in this project are shadow wage rate(which is estimated as 0.4W where W is the market wage rate) and marginal productivity of capital i.e. Economic Discount Rate(EDR) which is also taken as 11%. The opportunity cost of materials are taken as the willingness-to-pay; the willingness-to-pay is taken as the cost excluding subsidy. As we have already discussed in the methodology chapter that the willingness-to-pay is taken as 1.35 times higher than the financial cost. With these adjustments, when we estimated the economic costs of Gopalpur VWL, it came to be Rs.77,561/ (at constant prices at 1990-91) over the four cycles.

While evaluating benefits economically we have considered the willingness to pay price instead of auction price. We have taken the retail price as the willingness to pay

[1] Pant,M.M.(1986), "Forest Economics and valuation". Madhavi PublisheRs., Dehradun.
[2] Chopra, Kanchan, Gopal Kadekodi and MN Murthy(1989) "People's participation and common property resources". EPW, Dec23-30.

price. Generally the retail price is more than the auction price. From our primary data we have checked that the retail price of raw cashew(not so good in quality) is Rs.24/Rs.25 whereas the auction price is Rs.20/. Since the quality of cashew harvested from Gopalpur VWL is not of so high quality we have taken the willingness to pay or economic price of cashew as 1.2 times the auction price.

So far as timber is concerned the retail price is Rs.220/ whereas auction price is Rs.180 . Hence willingness to pay or economic price of timber is estimated as 1.22 times the auction price. With these adjustments we have estimated the economic/social costs and economic benefits(which are shown in the Table 6.2), the net of which gives the net economic benefits.

By introducing these adjustments we found that the total economic benefits comes to Rs.13,74,900 and economic costs as Rs.77,561. Hence, the net economic benefit is estimated as Rs.12,96,595 which means the net economic benefit is 1.28 times the financial net benefit. However, when we introduced the inter temporal variations by discounting those at11% EDR, the NPV, BCR and IRR changed significantly. The estimates are:

Table 6.4: The NPV, BCR and IRR Estimates of Gopalpur SFP (in terms of Economic consideration)

Criteria	EDR of 11%
NPV	Rs.1,62,000
BCR	7.81
IRR	43%

These above estimates established the economic feasibility of the project. In this context we would like to mention that the BCA of VWL plantation in Korea[3] had shown the economic IRR as 17% because the life span of the project was 20 years. And also the costs include supervision and harvesting operation which are excluded in our analysis. On the other hand, the BCA of Kenya saw log ply wood plantation project shows that the economic IRR of the project is 123% for 37 year life span. Of course, there the costs

[3] FAO(1979). Economic Analysis of Forestry Project: Case Studies. FAO Forestry Paper,17,1. Rome.

include administration, maintenance, supervision, protection, harvesting, etc. Hence our study lies in between these two studies as its life span is 40 years and it includes labour cost and material cost.

6.6 Socio-Economic-Environmental Evaluation of the Project

As stated in the last chapter, the non-marketed benefits known as externalities are not considered upto the economic evaluation stage. They are introduced in the Socio-Economic-Environmental analysis. In order to include those we have followed the CVM(already discussed in Chapter5). In evaluating the benefits socio-economically we have considered the fuel and fodder benefits of the project which are the products of plantation. The fuel benefit from leaves and twigs of trees from a 5 hectares plantation project are already estimated in the chapter 5. Since the project under consideration is over 5 hectare we have included that amount in the economic benefit stream. However, after the first cycle except cashew trees other trees are already harvested. Since cashew trees are not useful for fuel benefit we have not given any fuel benefit value for these first three years in each cycle. Accordingly, we have estimated that on the 4^{th} year of operation an amount of Rs.900/ is received from fuel; on the 5^{th} year it increases to Rs.1,350/ which later increases to Rs.1,800 from 6^{th} year till 10^{th} year. In the next cycle we have assumed the process to remain constant. Such estimated figures are shown in the Table 6.5.

In order to estimate other benefits of the project we have made an attempt to estimate the fodder benefit. As per the information collected from the local people, there were no vegetation in the area before plantation. But when plants were raised, grasses started growing which later used for fodder purposes. However, due to lack of actual data, we have assumed that nearly Rs.500/ per annum is saved from 4^{th} year onwards. Thus the year-wise benefit figures(from fuel and fodder) are added to the economic net benefit stream(shown in Table 6.5) resulting in the socio-economic net benefits of the project.

However, till this stage of the analysis we have not completed all the steps of SBCA. The environmental benefit which occupies a significant place for plantation projects is yet to be considered. As already discussed in Chapter 5, the standards used in our study for estimating environmental benefits is Rs.56,880/ per hectare per annum

at1990-91 prices. With the prevailing survival rate of different projects we have estimated the amount differently. For the sampled SFPs since the survival rate has been 80%, the per hectare per annum benefits estimated to be Rs.45,504/ and hence for

Table 6.5: Socio-Eco-Environmental Estimates of Gopalpur SFP

(Figures in thousand rupees)

(I)

	1985-86	86-87	87-88	88-89	89-92	92-94	94-95	95-96	96-97
A.COST									
Labour	6.75 (2.7)	5.25 (2.1)	2.75 (1.1)	1.5 (0.6)	–	–	–	6.75 (2.7)	5.25 (2.1)
Material	0.25 (0.33)	2.35 (3.17)	1.15 (1.55)	–	–	–	–	0.25 (0.337)	2.35 (3.172)
Total Cost (83-84)	7 (3.03)	7.6 (5.27)	3.9 (2.65)	1.5 (0.6)	–	–	–	7 (3.037)	7.6 (5.272)
Total Cost (90-91)	11.73 (5.09)	12.74 (8.84)	6.54 (4.44)	2.51 (1.006)	–	–	–	11.73 (5.094)	12.74 (8.842)
B.BENEFITS									
Fruits	--	--	–	–	0.5 (0.6)	1.0 (1.2)	2.0 (2.4)	2.0 (2.4)	2.0 (2.4)
Timber	--	--	--	–	–	--	410 (492)	–	--
Total Benefits (94-95)	--	--	--	--	0.5 (0.6)	1.0 (1.2)	412 (494.4)	2.0 (2.4)	2.0 (2.4)
Total Benefits (90-91)	--	--	--	–	0.332 (0.399)	0.665 (0.798)	273.9 (328.7)	1.33 (1.59)	1.33 (1.59)
Indirect Benefit (Fuel)	--	--	--	0.9	1.35	1.8	1.8	–	--
Fodder	--	--	–	0.5	0.5	0.5	0.5	–	--
Environmental Benefit	--	--	--	227	227	227	227	45	45
C. Net Benefit(90-91)	-11.73 (-5.09)	-12.74 (-8.84)	-6.54 (-4.44)	-2.51 (-1.006)	0.332 (0.399)	0.665 (0.798)	273.9 (328.7)	-10.40 (-3.49)	-11.41 (-7.24)
D. S-E Net Benefit	-5.09	-8.84	-4.44	0.394	2.249	3.098	331	-3.49	-7.24
E. S-E-E Net Benefit	-5.09	-8.84	-4.44	227.39	229.24	230.09	558	42.49	37.76

cont.

(II)

	97-98	98-99	99-04	04-05	05-06	06-07	07-08	08-09	09-10	10-13
A.COST										
Labour	2.75 (1.1)	1.5 (0.6)	--	--	6.75 (2.7)	5.25 (2.1)	2.75 (1.1)	1.5 (0.6)	--	--
Material	1.15 (1.552)	--	--	--	0.25 (0.337)	2.35 (3.172)	1.15 (1.552)	--	--	--
Total Cost (83-84)	3.9 (2.652)	1.5 (0.6)	--	--	- (3.037)	7.6 (5.272)	3.9 (2.652)	1.5 (0.6)	--	--
Total Cost (90-91)	6.54 (4.448)	2.51 (1.006)	--	--	11.73 (5.094)	12.74 (8.842)	6.54 (4.448)	2.51 (1.006)	--	--
B.BENEFITS										
Fruits	2.5 (3)	2.5 (3)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	2.5 (3)
Timber	--	--	--	410 (492)	--	--	--	--	--	--
Total Benefit (94-95)	2.5 (3)	2.5 (3)	3 (3.6)	413 (495.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	3 (3.6)	2.5 (3)
Total Benefit (90-91)	1.66 (1.99)	1.66 (1.99)	1.99 (2.39)	274 (329)	1.99 (2.39)	1.99 (2.39)	1.99 (2.39)	1.99 (2.39)	1.99 (2.39)	1.66 (1.99)
Indirect Benefit (Fuel)	--	0.9	1.35	1.8	--	--	--	0.9	1.35	1.8
Fodder	--	0.5	0.5	0.5	--	--	--	0.5	0.5	0.5
Environmental Benefits	45	227	227	227	45	45	45	227	227	227
C.Net Benefit (90-91)	-4.87 (-2.45)	-0.85 (0.98)	1.99 (2.39)	274 (329)	-9.74 (-2.7)	-10.75 (-6.44)	-4.54 (-2.05)	-0.52 (1.38)	1.99 (2.39)	1.66 (1.99)
D. S-E Net Benefit	-2.45	2.38	4.24	331.3	-2.7	-6.44	-2.05	2.78	4.24	4.29
E. S-E-E Net Benefit	42.55	229.38	231.24	558.3	42.3	38.56	42.95	229.78	231.24	231.29

cont.

(III)

	13-14	14-15	15-16	16-17	17-18	18-19	19-21	21-23	23-24	24-25	Total
A.COST											
Labour	--	--	6.75 (2.7)	5.25 (2.1)	2.75 (1.1)	1.5 (0.6)	--	--	--	--	65 (26)
Material	--	--	0.25 (0.337)	2.35 (3.172)	1.15 (1.552)	--	--	--	--	--	15 (20.25)
Total Cost (83-84)	--	--	7 (3.037)	7.6 (5.272)	3.9 (2.652)	1.5 (0.6)	--	--	--	--	80 (46.25)
Total Cost (90-91)	--	--	11.73 (5.094)	12.74 (8.842)	6.54 (4.448)	2.51 (1.006)	--	--	--	--	134 (77.56)
B.BENEFITS											
Fruits	2 (2.4)	2 (2.4)	2 (2.4)	2 (2.4)	2 (2.4)	1.5 (1.8)	1.5 (1.8)	1 (1.2)	0.5 (0.6)	--	72 (86.4)
Timber	--	410 (492)	--	--	--	--	--	--	--	420	1650 (1980)
Total Benefit (94-95)	2 (2.4)	412 (494.4)	2 (2.4)	2 (2.4)	2 (2.4)	1.5 (1.8)	1.5 (1.8)	1 (1.2)	0.5 (0.6)	420 (504)	1722 (2066)
Total Benefit (90-91)	1.33 (1.59)	274 (328.7)	1.33 (1.59)	1.33 (1.59)	1.33 (1.59)	0.99 (1.19)	0.99 (1.19)	0.665 (0.798)	0.332 (0.399)	279 (335)	1145 (1396)
Indirect Benefit (Fuel)	1.8	1.8	--	--	--	0.9	1.35	1.8	1.8	1.8	45
Fodder	0.5	0.5	--	--	--	0.5	0.5	0.5	0.5	0.5	14
Environmental Benefits	227	227	45	45	45	227	227	227	227	227	6761
(c)Net Benefit(90-91)	1.33 (1.59)	274 (328.7)	-10.40 (-3.49)	-11.41 (-7.24)	-5.21 (-3.25)	-1.51 (0.191)	0.99 (1.19)	0.665 (0.798)	0.332 (0.399)	279 (335)	1011 (1318)
D. S-E Net Benefit	3.89	331	-3.49	-7.24	-3.25	1.591	3.04	3.098	2.699	337.3	1377
E.S-E-E Net Benefit	230.8	558	41.51	37.76	41.75	228.59	230.0	230.09	229.69	564.3	8138

Gopalpur project the benefit comes out to be Rs.2,27,520. We have added this amount to the socio-economic net benefit stream from 4th year onwards of each cycle of the project. It is already mentioned that this is a typical project where along with casuarina and eucalyptus, cashew trees are there, the life span of which is 40 years. Hence after each 10 year cycle for next three years the significant environmental benefits are flowing from the cashew trees which are very less in number(90-95). We have assumed that the total area of these trees is maximum around 1 hectare. Accordingly the environmental benefits are estimated(Rs.45,504/-)and are added in the socio-economic net benefit stream(shown in Table 6.5) resulting in socio-eco-environmental net benefits.

Table 6.6: The NPV, BCR and IRR Estimates of the Gopalpur SFP (in terms of Socio-Economic-Environmental Consideration)

(NPV in thousand rupees)

	Stages	NPV	BCR	IRR
I.	Socio-Economic Estimates	855	16.07	46%
II.	Socio-Eco-Environmental Estimates	5336	95.13	242%

In order to incorporate the inter temporal time preference the socio-economic net benefits are then discounted at 2 % social rate of discount to calculate the NPV, BCR and the IRR of the project, which are given below in Table 6.6.

From the above mentioned results it is very clear that the Gopalpur project is socially viable in all the cases. While the addition of fuel and fodder benefits increases the NPV to Rs.13,77,000/, the addition of environmental benefits further increases the NPV to Rs.81,38,000/.

In view of these high and satisfactory NPV, BCR, and IRR results, we have to conclude that in terms of financial feasibility tests, the Gopalpur VWL is proved to be profitable; in economic feasibility tests it is also feasible and from socio-economic point of view it has proved to be socially viable.

CASE STUDY 2: Evaluation of the Mundal SFP

6.7 Brief History of the Mundal SFP

Though the SFP in Orissa launched in 1983-84, with the assistance of SIDA, the message of Social Forestry reached the village Mundal(a village under Jatani block in the district Puri) in 1986. The village Mundal with 100 families comprises of two hamlets with 60 families belonging to the backward class, whose economic standard is very low. Most of them are working as agricultural labourers. Fuel scarcity had has been a major problem for them. However, they had no idea how to overcome that problem.

There was a patch of 7 ha. unused Government land which was not useful for any productive purposes. But with the focus on social forestry on degraded land, the SF Range, Bhubaneswar realised that such degraded land can be useful for plantation activities. In order to motivate the people for social forestry, the Forest Department constituted a Village Forest Committee and persuaded the people to go for plantation on the degraded land. In view of these efforts, 17,500 plants were planted in 1987-88. The plants were of two varieties i.e. Acacia, and Eucalyptus. These two varieties are mainly beneficial for fuel purposes. With a survival rate of 80%, at the end of 10 year cycle, those trees were harvested. In total 3,196 trees were felled from which 189 tonnes of firewood and 1,632 poles were harvested and a part of it was distributed among the villagers. The rest were sold for Rs.1,35,000/ which was received as revenue in the hands of Village Forest Committee. After discussion with the villagers, the Committee decided to replant the area, for which it purchased 50,000 seedlings from the SFP nursery. The rest of the amount they deposited in the bank in two pass books-one for the village development fund and the other for the village forest development fund. From the first account they are using the money for construction of village temple and one plat form for community use.

6.8 The Costs and Benefits of the Project

Like the Gopalpur VWL, we have estimated the costs for the Mundal VWL by taking into account the per hectare plantation cost(fixed by the Directorate of SFP, Bhubaneswar) and total area of the plantation project. As such the total cost is calculated to be Rs.28,000/ over the life span(unlike the first project here the life span is 10 years) of the project. This includes labour cost of Rs.22,750/ and material cost of Rs.5,250/. However, these figures are in 1983-84 prices.

The important benefit they got from the plantation are fuel and the motivation for further plantation. However, these benefits are not priced in the market, hence the only financial benefit is the timber harvest after maturity. As per the primary data collected from the villagers, an amount of Rs.1,35,000/ was received in 1996-97 after harvest.

6.9 Financial Analysis of Mundal SFP

The financial costs and benefits of the project are shown in the Table 6.7 given below. From the estimated cost and benefit figures we have calculated the net benefit of the project. But since the figures are in different prices(i.e. costs in 1983-84 prices and benefits in 1996-97 prices) we have adjusted them to 1990-91 level. Accordingly, the cost

Table 6.7: Financial and Economic Estimates of Mundal SFP

(Figures in thousand rupees)

Cost/Benefits	1987-88	88-89	89-90	90-91	91-92	92-96	96-97	Total
A. Costs								
1.Labour	9.45	7.35	3.85	2.1	--	--	--	22.75
	(3.78)	(2.94)	(1.54)	(0.84)				(9.1)
2.Material	0.35	3.29	1.61	--	--	--	--	5.25
	(0.472)	(4.441)	(2.17)					(7.08)
Total(MP)	9.8	10.64	5.46	2.1	--	--	--	28
	(4.252)	(7.38)	(3.71)	(0.84)				(16.18)
Total(90-91	16.43	17.84	9.15	3.52	--	--	--	46.95
prices)	(7.13)	(12.37)	(6.22)	(1.40)				(27.146)
B. Benefits								
1.Timber	--	--	--	--	--	--	135	135
Total(MP)					--		135	135
Total(90-91)					--		77.78	77.78
							(94.89)	(94.89)
C.Net	-16.43	-17.84	-9.15	-3.52	--	--	77.78	30.82
Benefits	(-7.13)	(-12.37)	(-6.22)	(-1.40)			(94.89)	(67.74)

Note: The figures in the parenthesis show the economic estimates of the same.

stream is inflated with a factor of 1.677 and the benefit stream is deflated with a factor of 0.576. Such calculations of costs and benefits are indicated in the Table 6.7 too.

An examination of the figures in Table 6.7 depicts that the total cost which is Rs.28,000 in 1983-84 prices has been inflated to Rs.46,956/ and the total benefit which is Rs.1,35,000/ has been deflated to Rs.77,780/ and thereby resulting in financial net benefit of Rs.30,824/.

In the next stage to introduce the inter temporal variations, we have discounted the net benefit flow with different rates of discount. For such evaluation purpose we have adopted the earlier discussed investment criteria of NPV, BCR and IRR. The results of such calculations are indicated in Table 6.8.

From the estimates it is very clear that the project is financially profitable at rates of discount below 10%. At 2% the NPV is Rs.18,600/; at 5% it declines to Rs.5090/ which becomes negative at 10% discount rate. Thus at the official rate of discount which varies from 10-12%, the NPV is negative implying non-profitability of the project. The

Table 6.8: The NPV, BCR and IRR Estimates of Mundal Project (in terms of Financial consideration)

Rate of Discount	NPV	BCR	IRR
0	30.8	1.65	6%
2	18.6	1.41	
5	5.09	1.11	
10	-8.9	0.76	
12	-13.1	0.66	

Note: Rate of discount and IRR in percentages; NPV in thousand rupees; BCR in number.

BCR is also low i.e. while at 2% discount rate it is 1.41, at 5% it is 1.11 and at 10% it is less than one, i.e. 0.76. More over, the low rate of IRR of 6% implies that the project is not capable of meeting the commercial rate of interest in the market. Thus though the

NPV criterion of the project shows that it is profitable at low rates of discount(2-5%), but the other two criteria imply the non-profitability of the project.

6.10 Economic Analysis of the Project

To calculate the economic cost we have followed the same procedure as adopted in the Gopalpur SFP. The labour component is adjusted with 0.4W where W is the market wage rate and the same adjustment has been made for the other material component i.e. the economic price of materials is taken as 1.35 times the market price Thereby the economic costs are calculated as Rs.27,146/(shown in Table 6.7). With the economic prices of timber taken as 1.22 times of the auction price(rationale is described in the last project), we have estimated the economic benefits as Rs.94,891/. Thus the net economic benefit is calculated to be Rs.67,745 which is 2.19 times higher than the net financial benefits. But these are based on undiscounted benefits and costs. When we introduced the economic discount factor of 11%, we got the economic NPV, BCR and IRR which are shown below in Table 6.9.

Table 6.9: The NPV, BCR and IRR Estimates of Mundal SFP (in terms of Economic consideration)

Criteria	EDR of 11%
NPV	Rs.11,000/
BCR	1.52
IRR	17%

From the above results it is clear that at 11% EDR the NPV has improved and the BCR is more than one and IRR is higher than market rate of interest. Hence the project is economically feasible.

But to these economic benefits then we added the indirect benefits flowing from fuel, fodder which are approximated by us. Through CVM we have estimated the standard fuel benefit from 5 hectares of eucalyptus, casuarina plantation. Adhering to the

procedures adopted earlier the fuel benefit of Mundal VWL has been Rs.1,260/ in the 4th year; Rs.1,890/ in the 5th year which increases to Rs.2,520/ in the 6th year and onwards. By adding the total fuel benefits, which is estimated to be Rs.15,750. We recalculated the benefit stream which is shown in the Table 6.10.

Table 6.10: Socio-Eco-Environmental Estimates of Mundal SFP

(Figures in thousand rupees)

Cost/Benefits	1987-88	88-89	89-90	90-91	91-92	92-93	93-96	96-97	**Total**
A. Costs									
1.Labour	3.78	2.94	1.54	0.84	--	--	--	--	**9.1**
2.Material	0.472	4.441	2.17	--	--	--	--	--	**7.08**
Total(MP)	4.252	7.38	3.71	0.84	--	--	--	--	**16.18**
Total(90-91 prices)	7.13	12.37	6.22	1.40	--	--	--	--	**27.146**
B. Benefits									
1.Timber	--	--	--	--	--	--	--	135	**135**
Total(MP)					--	--		135	**135**
Total(90-91)					--	--		94.89	**94.89**
Indirect Benefit(Fuel)	--	--	--	1.26	1.89	2.52	2.52	2.52	**15.75**
Fodder	--	--	--	0.5	0.5	0.5	1.0	1.0	**5.5**
F & F (90-91 prices)	--	--	--	1.76	2.39	3.02	3.52	3.52	**21.25**
Environmental Benefits	--	--	--	318	318	318	318	318	**2226**
C.Net Benefit	-7.13	-12.37	-6.227	-1.40	--	--	--	94.89	**67.74**
D. S-E Net benefits	-7.13	-12.37	-6.227	0.36	2.39	3.02	3.52	98.41	**88.99**
E. S-E-E Net Benefits	-7.13	-12.37	-6.227	318.36	320.39	321.02	321.52	416.41	**2314.99**

With a view to include the fodder part of the benefit in the economic analysis(i.e. benefit from 'net resources saved' point) we have estimated that over the years the project would render Rs.5,500/ by way of fodder supply. This approximation is based on the local price of fodder. But this benefit would flow from the 4th year as prior to that it is very negligible as the area was not suitable for fodder cultivation in the beginning due to degraded soil. We have assumed that the fodder benefit in 4th year to 6th year would be

Rs.500 per annum and later increased to Rs.1,000/ from 7th year onwards. These are shown in the Table 6.10. The addition of these fuel and fodder benefit has raised the net benefits to Rs.88,990/.

6.11 Socio-Economic-Environmental Evaluation of the Project

Furthermore, the environmental benefits are estimated in the same pattern as of the Gopalpur project which is estimated to be Rs.45,504/ per hectare per annum. Since the area of Mundal project is 7 hectare, the corresponding environmental benefits has been calculated as Rs.3,18,528 per annum. It is already mentioned earlier that we have assumed the environmental benefits to be included from 4th year onwards(discussed in Chapter5); hence the total environmental benefits over the life span becomes Rs.22,26,000 which is added to the net benefit stream(shown in Table 6.10). Finally, the net socio-economic-environmental benefits has been calculated as Rs.23,14,990/ which is 75 times the net financial benefits.

As has already been discussed in the Gopalpur SFP, we have taken 2% as the SRD and have estimated the NPV, BCR and IRR of the project which are shown in Table 6.11.

Table 6.11: The NPV, the BCR and the IRR Estimates of Mundal VWL (in terms of Socio-Economic-Environmental considerations)

(NPV in thousand rupees)

Stage	NPV	BCR	IRR
I. Socio-Economic Estimates	69.7	3.67	22%
II. Socio-Eco-Environmental Estimates	2009	78.09	242%

From the above table it is very clear that the Mundal SFP is a socially viable project. When environmental benefits are included, all the criteria values like NPV, BCR IRR improve significantly. A comparison of the environmental benefits with the total

benefits of the project reveals that the environmental benefits of Mundal SFP is 96.15% of the total benefits. This result is at par with other studies like Mathur[4](1980). In his study Mathur had estimated that the ecological benefits constitute 99.94% of the total benefits of a forestry project.

6.12 Concluding Observation

The socio-economic and financial analysis of the SFPs, viz., Gopalpur SFP and Mundal SFP have established that the plantations under social forestry programme with people's participation are extremely viable projects.

[4] Mathur, H.N. and Soni P.(1980), "Non-wood Benefits of Forests: An Effort at quantification", 'The Environment' Journal of the Indian Forest college, Dehradun, pp5-9.

Chapter 7

SBCA OF PLANTATION PROJECTS: CASE STUDIES OF TERRITORIAL PLANTATIONS, ORISSA

7.0 Introduction

We have already analysed the plantations by SFPs through SBCA in chapter6. Since our prime objective is to compare different plantation schemes, in this chapter we would like to analyse the plantations undertaken by the territorial division of Forest Department of Government of Orissa. After discussing the general features of the sample projects we have examined the financial viability of the projects, which is followed by socio-economic analysis.

7.1 Basic Features of the Sample Projects

As discussed in chapter 4 the Territorial Division, being the most traditional and conventional wing of the Forest Department is actively involved in the plantation activities. As stated earlier though it is involved in protection and regeneration of reserved forests, of late, it has started block plantation in order to increase the green coverage. Through our method of sample selection we have selected two projects of the territorial division, viz. Balukhanda Coup-11(C11) and Coup-13(C13) of district Puri where block plantations of casuarina have been undertaken by the Forest Department of Government of Orissa in 1990-91. These two coups are managed and operated by territorial wing of Forest Department. By taking into account the soil and moisture characteristics which is sandy and saline respectively, the Forest Department had proposed casuarina plantation that was ideal for the area. Moreover, casuarina provides good fuel wood to meet the local demand. In fact, the local demand for fuel wood is very high due to the typical system of cooking adopted in the world famous temple of Lord Jagannath at Puri. It is estimated that the temple needs around 400 quintals of fuel wood daily for its operation. To add to it, the holy cremation ground at Puri(known as Swargadwar) requires nearly 40

quintals of wood daily. In order to meet such growing demand, the territorial division have planted 20,000 casuarina plants in C-11 and 15,000 plants in C 13. While the area of C-11 is 8 hectares, C-13 covers an area of 6 hectares. The survival rate in both the cases has been 70%. Regarding the operation and maintenance of these projects, we have learnt that the territorial division plants the seedlings, takes care of the plants till the third year and then tries to protect them through its own staff members. However, when the project attains maturity it is auctioned and generally awarded to OFDC, which deals with marketing of forest products.

Since these projects are in operation, we propose to undertake an ex-ante SBCA of those plantation schemes at Balukhanda C 11 and C 13 of Puri district. Since the projects are yet to attain their life span, the future benefits are estimated on the basis of similar projects where harvesting was undertaken earlier. Hence, to estimate the costs and benefits of these projects, we have collected the costs and benefits from concerned officials. However, when the required data are not available, we have estimated the figures on the basis of our field experience or from the observations of the concerned officials.

Case Study I: **EVALUATION OF BALUKHANDA C11**

7.2 Costs of the Project Balukhanda C11

The important cost components of these projects are land, labour and other materials. Since land is owned by the Forest Department, it involves no fixed cost for the financial analysis. Thus, the projects have to pay for labour and materials. The total cost figures for the project C-11 as collected from the concerned office(District Forest Office, Khurda) have been Rs.50,000/ which include Rs.35,000/ as labour charges and Rs.15,000/ as material charges. Buut the details of the components of material were not available to us. However, we learnt that in the first year of operation, Rs.10,000/ was spent on labour and Rs.3,000/ on materials; in the second year of operation a higher amount, Rs.12,000/ was being spent on labour and Rs.7,000/ on materials. The details of the costs are given in

Table 7.1. From 5th year onwards there was no financial cost as such. The maintenance cost was negligible as reported by the concerned officials.

Table 7.1: Financial Costs of Balukhanda C11

(Figures in rupees)

Year	Labour	Material	Total Cost
1990-91	10000	3000	13000
91-92	12000	7000	19000
92-93	10000	3000	13000
93-94	3000	2000	5000
94-2000	nil	nil	nil
Total	35000	15000	50000

7.3 Benefits of the Project Balukhanda C11

The direct benefit of the project is the timber benefit from casuarina trees. The harvest will be done after the maturity of the trees. Since the life-span of these trees are taken as 10 years, only at the end of year 2000 the trees will be harvested and the benefits will be received. But, for our analysis, we have estimated the benefits on the basis of a project which was already harvested in 1996-97. That project was of 21 hectares, the same casuarina plants(2500 per hectare) with the same survival rate of 70% were also there. It is reported that after the felling, it provided 1,088 stacks of logs, 6.536 ballahas and 200 stacks of twig and firewood. At the rate of Rs.180/ per quintal of logs, Rs.4/ per ballaha and Rs.70/ per quintal of firewood, the total amount of revenue received was Rs.40,42,500/. Thereby, it was estimated that per hectare financial benefit was Rs.1,92,500/. Taking into account this estimate which has been collected from the DFO, Khurda, we have estimated the direct benefit of both the projects. Accordingly, the total benefits from C11 have been estimated as Rs.15,40,000.

With these estimation of costs and benefits we have moved on to financial evaluation with a view to check profitability and feasibility of the project, which is later followed by economic evaluation and then by socio-eco-environmental evaluation.

7.4 Financial Analysis of the Project

As a first step of SBCA, financial evaluation exercise has been completed whereby the financial cash-flow of the project are estimated. The costs and benefit estimates are shown in Table 7.2. In the financial analysis we have calculated the net benefits which is total benefits minus total costs.

Table 7.2: Financial and Economic Estimates of Balukhanda C11 Project

(Figures in thousand rupees)

Cost/Benefits	1990-91	91-92	92-93	93-94	94-97	97-99	99-2000	**Total**
A. Costs								
1.Labour	10	12	10	3	--	--	--	**35**
	(4)	(4.8)	(4)	(1.2)				**(14)**
2.Material	3	7	3	2	--	--	--	**15**
	(4.05)	(9.4)	(4.05)	(2.7)				**(20.25)**
Total(MP)	13	19	13	5	--	--	--	**50**
	(8.05)	(14.25)	(8.05)	(3.9)				**(34.25)**
Total(90-91	13	16.7	10.3	3.6	--	--	--	**43.7**
prices)	(8.05)	(12.25)	(6.42)	(2.87)				**(29.87)**
B. Benefits								
1.Timber	--	--	--	--	--	--	1540	**1540**
Total(MP)					--		1540	**1540**
Total(90-91)					--		887	**887**
							(1082)	**(1082)**
C.Net	-13	-16.7	-10.3	-3.6	--	--	887	**843**
Benefit	(-8.05)	(-12.25)	(-6.42)	(-2.87)			(1082)	**(1052)**

Note: The figures in the parenthesis show the economic estimates of the same.

The total benefit from C-11 has been estimated as Rs.15,40,000/ and the total cost has been Rs.50,000/; at market prices and as per most traditional method the net benefit is Rs.14,90,000/. But here there are few flaws; first of all, the figures are not based on the prices of the base year. Secondly, the inter-temporal variations are not being considered.

In order to overcome these limitations, we have attempted to estimate the net benefit in the following manner.

As the costs are in different year prices(i.e.1990-91, 91-92, 92-93, 93-94), we have deflated those to 1990-91 level by the deflation factors[1] of 0.879, 0.798, and 0.737 respectively. In this process the total costs in 1990-91 prices have been estimated as Rs.43,760/.

Similarly the benefits which are estimated on the basis of other project are based on 1996-97 prices. To ensure a common price level, we have deflated the benefit figures to 1990-91 level with the factor 0.576. Thereby the direct benefits(at 1990-91 prices) have become Rs.8,87,000. With these the total costs and total benefits, we have estimated the undiscounted net benefit which has been Rs.8,43,000. But when we introduced discounting the net benefit stream as well as cost stream changed. By using 2%, 5%, 10%, and 12% rate of discount we have estimated the NPV, BCR and IRR which are shown below in Table 7.3.

Table7.3: The NPV, BCR and IRR Estimates of Balukhanda C11 Project (in terms of Financial consideration)

Rate of Discount	NPV	BCR	IRR
0	843	20.27	45%
2	685	17.13	
5	505	13.70	
10	306	9.50	
12	251	8.24	

Note: Rate of discount and IRR are in percentages; NPV in thousand rupees; BCR in number.

The above results show that net present values of Balukhanda C11 are positive at different rates of discount, ranging from 0% to 12%. While at 10% discount rate, the NPV is Rs.3,06,000/, at 12% rate it is Rs.2,51,000/. Also the BCR and IRR are quite high; at

[1] WPI of 1990-91, 91-92, 92-93, 93-94 are 182.7, 207.8, 228.7, 247.8. Thus, deflation factor for 1991-92 is Price Index of 1990-91 divided by Price index of 1991-92, i.e. 182.7/207.8=0.879. Other deflation factors are derived similarly.

10% the BCR is 9.5 and at 12% it is 8.24. The financial IRR is estimated as 45% implying high profitability of the projects from financial point of view. However, for economic feasibility we have to move to economic analysis.

7.5 Economic Analysis of the Project

As stated earlier in the economic analysis the distortions in the market prices of inputs and outputs are avoided by introducing economic shadow prices. In the same token, adjustments are introduced to take care of labour, material and timber values. Since the land used for plantations are reserved forest area of Forest Department, the opportunity cost is negligible and hence not included in our analysis. As far as labour component is concerned, we have learnt that the total labour force used for this type of plantations are unskilled ones; no skilled labour is being required. We have already discussed in chapter 5 that the shadow wage rate of unskilled labour is taken as 0.4W where W is the market wage rate. With the shadow wage rate adjustment, the economic labour cost is reduced to Rs.14,000/ from Rs.35,000/.

The material component is generally divided into three parts: saplings, fertilisers, and implements. Since for this project the data regarding each component are not available, we have approximated on the basis of our field experiences. It is reported to us that generally 50% of material cost is being spent on fertilisers, 30% on saplings and 20% on implements. The fertiliser and saplings are highly subsidised; fertiliser is being subsidised at 40% while saplings are subsidised at 30%. Thus, the average subsidy is 35%. This subsidy component has to be added to the market price in order to get the economic price of the inputs. Thus, the economic price of material inputs has been 1.35 times of the market prices.

As far as outputs are concerned, timber is generally auctioned through OFDC; and the auction price is always less than the retail price. While the auction rate of timber is Rs.180/ per quintal, the retail price is Rs.220/. Thus the willingness to pay which is best reflected through the retail price has become 1.22 times of the auction price. With these

changes when the net economic benefit is estimated, its value has been worked out to be Rs.1,052,000 (details are shown in Table 7.2). This implies that the economic net benefits are 1.24 times that of the net financial benefits.

However, to account for inter temporal variations when we introduced the economic discount rate of 11%, the values of NPV, BCR and IRR improved significantly. These values are shown in Table 7.4.

Table 7.4: The NPV, BCR and IRR Estimates of Balukhanda C-11 (in terms of Economic consideration)

Criteria	EDR 11%
NPV	Rs.3,57,000/
BCR	15.8
IRR	56%

As the above figures show the NPV at 11% EDR is Rs.357.000/; the BCR is 15.8 and the economic IRR is 56%. Thus, economically the project is quite feasible.

To this net economic benefit when we added indirect benefits in the form of fuel and fodder which usually flow from any plantation project, but are generally not marketed, the net benefits increased. Though financial analysis these are not included; but from society's point of view these should be included as these satisfy poor people's demand for fuel and fodder which is nothing but one of the national goal. So we have estimated those values and added in our socio-economic analysis.

As discussed in the chapter 5, the standard fuel benefit from a 5 hectare plantation area is estimated through CVM. Adhering to the same estimates, the fuel and fodder benefits are calculated by us, which are shown in Table 7.5. As mentioned above the fuel benefits flow from 4th year. Starting with Rs.1,440/ in 4th year, the amount increased to Rs.2,160/ in the 5th year and Rs.2,880/ from the 6th year onwards till the end. Thereby the total fuel benefits are estimated as Rs.18,000/.

As far as the fodder benefit is concerned we have assumed a lump sum amount of Rs.500 being saved from 4th year which later increased to Rs 1,000 from 8th year onwards; and the total benefits are estimated to be Rs.5,000/. These benefits are added to the economic net benefit stream. Since the project is financially and economically highly profitable, naturally the addition of more social benefits are expected to increase the social profitability of the project. The addition of fuel and fodder benefits have increased the social net benefit to Rs.1075,000/.(shown in Table 7.5).

Table 7.5: Socio-Eco-Environmental Estimates of Balukhanda C11 Project

(Figures in thousand rupees)

Cost/Benefits	1990-91	91-92	92-93	93-94	94-97	97-99	99-2000	**Total**
A. Costs								
1.Labour	10	12	10	3	--	--	--	**35**
	(4)	(4.8)	(4)	(1.2)				**(14)**
2.Material	3	7	3	2	--	--	--	**15**
	(4.05)	(9.4)	(4.05)	(2.7)				**(20.25)**
Total(MP)	13	19	13	5	--	--	--	**50**
	(8.05)	(14.25)	(8.05)	(3.9)				**(34.25)**
Total(90-91	13	16.7	10.3	3.6	--	--	--	**43.7**
prices)	(8.05)	(12.25)	(6.42)	(2.87)				**(29.87)**
B. Benefits								
1.Timber	--	--	--	--	--	--	1540	**1540**
Total(MP)					--		1540	**1540**
Total(90-91)					--		887	**887**
							(1082)	**(1082)**
Indirect Benefits(Fuel	--	--	--	1.44	2.16	2.88	2.88	**18**
Indirect Benefits(Fodder)	--	--	--	0.5	0.5	1.0	1.0	**5**
Total F&F(90-91)	--	--	--	1.94	2.66	3.88	3.88	**23**
Env. Benefits	--	--	--	318.5	318.5	318.5	318.5	**2229.5**
C.Net	-13	-16.7	-10.3	-3.6	--	--	887	**843**
Benefit	(-8.05)	(-12.25)	(-6.42)	(-2.87)			(1082)	**(1052)**
D. S-E Net Benefits	-8.05	-12.52	-6.42	-0.93	2.66	3.88	1085.88	**1075**
E. S-E-E Net Benefits	-8.05	-12.52	-6.42	317.57	321.16	322.38	1404.38	**3304.5**

The figure in the parenthesis shows the economic estimates of the same.

As far as environmental benefits of the project are concerned we have proceeded in the same manner as in case of SFP. In chapter 5 it is mentioned that for the estimation of environmental benefits we have adopted the estimation of Rath et al(1997) which has been based on FRI scientists studies. They have estimated the per hectare benefit to be Rs.56.880/. With those estimates and with the survival rate of 70%, the environmental benefits have been estimated to be Rs.3,18,528 per annum and the total benefits over the life span would be Rs.2,229500. When these are included in the socio-economic net benefit stream(shown in Table 7.5), the total socio-eco-environmental net benefit has been Rs.3,304,000. With those modified calculation of net benefits in terms of socio-eco-environmental benefit stream, the criteria of NPV, BCR and IRR are estimated at 2% which are shown below in Table 7.6.

Table 7.6: The NPV, BCR and IRR Estimates of Balukhanda C11 Project (in terms of Socio-Economic-Environmental Considerations)

(NPV in thousand rupees)

Stage	NPV	BCR	IRR
I. Socio-Economic Estimates	879	31.6	58%
II Socio-Eco-Environmental Estimates	2821	99.5	233%

The figures in the table shows that as a result of, addition of environmental benefits, the NPV and BCR increase by more than 3 times and the IRR becomes 233%. Thus it is needless to say that the project is highly profitable from every angle.

Case Study 2: EVALUATION OF BALUKHANDA C-13 PROJECT

Since the basic features of the project Balukhanda C-13 are described in the beginning of this chapter(in the section 7.1). We have started with the costs and benefits aspects of the project.

7.6 Costs and Benefits of Balukhanda C13 Project

As per the data collected from the DFO, Khurda, the total costs of the project have been estimated as Rs.37,500/. With a labour cost component of Rs.26,250/ and material cost component of Rs.11,250/. Like Balukhanda C-11 in this case also the maintenance costs after fourth year of operation were not included because those were negligible.

Table 7.7: Financial Costs of Balukhanda C13 Project

(Figures in rupees)

Year	Labour	Material	Total Cost
1990-91	8000	2000	10000
91-92	10000	6000	16000
92-93	6000	2000	8000
93-94	2250	1250	3500
94-2000	nil	nil	nil
Total	26250	11250	37500

Source: DFO, Khurda.

As shown above, in the first year of operation an amount of Rs.8,000/ was being spent on labour component and Rs.2,000/ on materials; in the second year both the figures were higher, but in the subsequent years these were less. Finally after 4th year there were virtually no significant costs.

As far as timber benefits are concerned, we have estimated those in the exactly similar manner as has been done for Balukhanda C-11 and accordingly the estimated figure has been Rs.1,155,000. With these costs and benefits estimates we have undertaken the exercise of financial analysis, followed by economic analysis, and then socio-eco-environmental analysis.

7.7 Financial Analysis of the Project

For such an analysis, the cash-flows are drawn which are provided in Table 7.6. Following crude method the net benefit of the project is calculated to be Rs.1,117,000/. But in such exercise the prices are neither adjusted nor the inter-temporal variations are introduced.

Table 7.8: Financial and Economic Estimates of Balukhanda C13 Project

(Figures in thousand rupees)

Cost/Benefits	1990-91	91-92	92-93	93-94	94-99	99-2000	Total
A. Costs							
1.Labour	8	10	6	2.25	--	--	**26.25**
	(3.2)	(4)	(2.4)	(0.9)			**(10.5)**
2.Material	2	6	2	1.25	--	--	**11.25**
	(2.7)	(8.1)	(2.7)	(1.68)			**(15.18)**
Total(MP)	10	16	8	3.5	--	--	**37.5**
	(5.9)	(12.1)	(5.1)	(2.58)			**(25.68)**
Total(90-91	10	14.06	6.3	2.5	--	--	**33.02**
prices)	(5.9)	(10.63)	(4.06)	(1.90)			**(22.51)**
B. Benefits							
1.Timber	--	--	--	--	--	1155	**1155**
Total(MP)						1155	**1155**
Total(90-91)						665	**665**
						(811)	**(811)**
C.Net	-10	-14.06	-6.3	-2.5	--	665	**632**
Benefit	(-5.9)	(-10.63)	(-4.06)	(-1.9)		(811)	**(789)**

Note: The figures in the parenthesis show the economic estimates of the same.

As regards the price adjustment, we have adhered to the procedure adopted for other projects. After such adjustments of the costs to 1990-91 level, the total costs reduced to Rs.33,027/. The benefits based on 1996-97 prices when adjusted to 1990-91 level became Rs.6.65,280/. Thus the net benefit rose to is Rs.6.32.253/ (shown in the Table 7.8).

However, in these estimations the inter-temporal variations are not introduced. So with the help of different rates of discount the NPV, BCR and IRR are estimated and the results are shown below in Table 7.9.

Table7.9: The NPV, BCR and IRR Estimates of Balukhanda C13 Project (in terms of Financial consideration)

Rate of Discount	NPV	BCR	IRR
0	632	20.14	45%
2	514	17.2	
5	378	13.6	
10	229	9.4	
12	188	8.13	

Note: Rate of discount and IRR in percentages; NPV in thousand rupees; BCR in number.

As the table shows that at 10% discount rate, the NPV is Rs.2,29,000/, and at 12% rate it declines to Rs.1,88,000/. The BCR at the corresponding rates are 9.4 and 8.13 respectively. The financial IRR is also seen to be 45% which is the same as the other territorial plantation project.

7.8 Economic Analysis of the Project

With a view to take care of the market imperfections, the market prices are substituted by the set of prices. As it is a case of territorial plantation, the procedure applied to this project for economic adjustment is very similar to what has been applied for the other project Balukhanda C-11. With the economic adjustment for labour, material and timber which are shown in Table 7.8 the economic net benefit is estimated. While the net financial benefit is estimated to be Rs.6,32,000/, the net economic benefit is calculated as Rs.7,89,000/ which is 1.24 times higher than the net financial benefit.

The net economic benefit stream when discounted at the economic rate of discount(11%), the corresponding NPV, and BCR improved.

Table 7.10: The NPV, BCR and IRR Estimates of Balukhanda C-13 (in terms of Economic consideration)

Criteria	**EDR 11%**
NPV	Rs.2,68,000/
BCR	15.7
IRR	56%

The above estimates confirm that the projects is economically viable. In the next step the indirect benefits in the form of fuel and fodder are added, which are estimated in the same manner as of Balukhanda C-11.

Similarly, the fuel benefit is estimated as Rs.1080/ in the 4th year which later increased to Rs.1,620/ in the 5th year. It further increased to Rs.2,160/ in the 6th year which continued till the end. The fodder benefit which is approximated on the basis of primary level discussions is taken as Rs.400/ in 4th year and it increased to Rs.500 for the rest of the period. Thus the total fuel and fodder benefits are estimated to be Rs.16,800/. With these additions to the net economic benefits, the flow of net socio-economic benefit is estimated which are shown in the Table 7.11.

With the addition of Rs.16,800 of indirect benefits, the net benefits of the project increased to Rs.8,05,000. This is the undiscounted socio-economic net benefit. As discussed in the methodology chapter, the appraisal of any forestry projects from society point of view ought to be discounted at 2% social discount rate.

Table 7.11: Socio-Eco-Environmental Estimates of Balukhanda C13 Project

(Figures in thousand rupees)

Cost/Benefits	1990-91	91-92	92-93	93-94	94-97	97-99	99-2000	**Total**
A. Costs								
1.Labour	8	10	6	2.25	--	--	--	**26.25**
	(3.2)	(4)	(2.4)	(0.9)				**(10.5)**
2.Material	2	6	2	1.25	--	--	--	**11.25**
	(2.7)	(8.1)	(2.7)	(1.68)				**(15.18)**
Total(MP)	10	16	8	3.5	--	--	--	**37.5**
	(5.9)	(12.1)	(5.1)	(2.58)				**(25.68)**
Total(90-91	10	14.06	6.3	2.5	--	--	--	**33.02**
prices)	(5.9)	(10.63)	(4.06)	(1.90)				**(22.51)**
B. Benefits								
1.Timber	--	--	--	--	--	--	1155	**1155**
Total(MP)							1155	**1155**
Total(90-91)							665	**665**
							(811)	**(811)**
Indirect Benefits								
Fuel	--	--	--	1.08	1.62	2.16	2.16	**13.5**
Fodder	--	--	--	0.4	0.4	0.5	0.5	**3.3**
F&F(90-91)	--	--	--	1.48	2.02	2.66	2.66	**16.8**
Env.Benefits	--	--	--	238	238	238	238	**1666**
C.Net Benefit	-10	-14.06	-6.3	-2.5	--	--	665	**632**
	(-5.9)	(-10.63)	(-4.06)	(-1.9)			(811)	**(789)**
D.Socio-Eco Net Benefit	-5.9	-10.63	-4.06	-0.42	2.02	2.66	813.66	**805.8**
E. S-E-E Net Benefits	-5.9	-10.63	-4.06	237.58	240.02	240.66	1051.66	**2471.8**

Note: The figures in the parenthesis show the economic estimates of the same.

Till now the environmental factors are not included. As has been expressed in the methodology chapter without the environmental factors the SBCA of plantation projects are not complete. The procedure to include those benefits are already discussed in the methodology chapter(Chap 5). Taking into account the per hectare per annum benefit as Rs.56,880/, and with 70% survival rate, the net benefit is estimated to be Rs.39,816 per hectare per annum for territorial plantations. Accordingly the value of such benefits of Balukhanda C-13 project is estimated to be Rs.2,38,896 per annum. In the next step the decision criteria like NPV, BCR and IRR are estimated at 2% SRD, which are provided in the following table.

Table 7.12: The NPV, BCR and IRR Estimates of Balukhanda C13 Project (in terms of Socio-Economic-Environmental Consideration)

(NPV in thousand rupees)

Stage	NPV	BCR	IRR
I. Socio-Economic Estimates	658	31.4	58%
II Socio-Eco-Environmental Estimates	2110	98.6	230%

Naturally the addition of more benefits in the form of fuel and fodder improved the net social benefits of the project, and at 2% SDR the NPV became Rs.6,58,000/ and the BCR as 31.4. The environmental benefits further added to the net socio-economic benefit stream and at 2% SDR the NPV became Rs.21,10,000 which was more than 3 times higher than the earlier estimates.

The above results clearly depict that both the territorial plantation projects are quite viable from the socio-eco-environmental point of view. The high BCR and IRR also prove that environment has a great role in the socio-economic impact of the plantation projects.

Chapter 8

SBCA OF PLANTATION PROJECTS: CASE STUDIES OF CASHEW PLANTATIONS, ORISSA

8.0 Introduction

With reference to the various agents involved in plantation in Orissa, as discussed earlier, the Orissa State Cashew Development Corporation is also one of the agents involved in plantation activities. As a specialised agency for cashew nut development it has been engaged in cashew plantation from 1981-82. Among the 131 plantation projects under the Corporation, as discussed in chapter 5 the Ranpur cashew project in Khurda division of Puri district is a major one. Another successful project is Kadamjhola 3 in the same division of Puri district. These two projects have been chosen for evaluation in our study. With a brief historical background of those projects, we have attempted to evaluate them in terms of financial analysis as well as socio-economical analysis to arrive at the policy implications.

CASE STUDY 1: **EVALUATION of RANPUR PROJECT**

8.1 Brief History of Ranpur Cashew Project

There was a tract of Government land covering 255 hectares in Ranpur of Khurda division of Puri district in Orissa, which had no productive use as the soil was not suitable for cereals etc. It was also hilly area without any irrigation facility. In order to check soil erosion,the Orissa State Cashew Development Corporation, on behalf of the Soil Conservation Department started the cashew plantation project on that tract of land in 1981-82. The life span of the project is 40 years which means it will be terminated in 2020-21. Though from third year onwards the flowering starts in the cashew plant, however, the real production starts from 5^{th} year onwards. With increase in the potentiality of the plants, the production attains the maximum on the 10^{th} year. In respect of harvesting of its products, we learnt that every year when the flowering starts, the Corporation auctions the project; and thereby it awards the contract to the party which quotes the

maximum revenue. Then it is the task of the contractor to watch and ward, pluck the flowers and harvest the seeds.

It is very clear that these cashew development projects are long term projects. For such kind of long term projects it is necessary to appraise them through the tool of SBCA so as to establish their financial/commercial and socio-economic viability. Such exercises are undertaken by us, which are elaborated in the following section.

8.2 Costs and Benefits of the Project

The major costs of this project comprise of the variable cost because the fixed cost part is very negligible owing to government ownership over the land. The components of variable costs are labour, material and maintenance. The cost of labour and material components are estimated by us with the help of the unit data/information received from the Cashew Corporation regarding the labour cost and material cost for one hectare of cashew plantation. Since the prices used for such unit requirement was based on 1990-91 level; in our estimation of the labour and material cost we have not made any inflationary adjustments. However, the maintenance cost is calculated from the primary sources and it is assumed that the future maintenance cost be the same as that of the present one. Accordingly, the total cost is estimated to be Rs.72,58,000/ (in 1990-91 prices) over 40 years out of which the labour component is Rs.32,52,000/, and the material component Rs.14,86,000/. The maintenance cost is estimated to be Rs.25,20,000/. The year-wise costs figures are shown in Table 8.1.

Table 8.1: Financial Cost Estimates of Ranpur Cashew Plantation Project

(Figures in rupees)

Year	Labour Cost	Material Cost	Maintenance Cost		Total Cost
			Labour	Main.	
1981-82	13,97,000	5,90,000			19,87,000
82-83	7,75,000	2,35,000			10,10,000
83-84	5,30,000	3,20,000			8,50,000
84-85	5,50,000	3,41,000			8,91,000
85-2021	nil		63000	7000	70,000
Total	32,52,000	14,86,000	25,20,000		72,58,000

Source: Estimated by us from the unit requirement prescribed by the Cashew Corporation.

It is clear from the Table 8.1 that the labour cost is the maximum in the first year of operation unlike the other projects of SFPs and Territorial division and it is almost two and half times of the material costs. Of course, the primacy of the labour cost is maintained throughout the life span of the project. The implication is that for such kind of projects ground preparation of the site which is a hilly terrain involves a lot of labour to do the job. As regards regular employment it is reported to us that there are 6 persons who are in charge of the project, and they have been protecting as well as maintaining the cashew plants. With the help of their monthly remuneration which is Rs.875/(at 1990-91 prices), it is estimated that the maintenance cost would be Rs.63,000/ per annum. Besides the labour component a lump sum amount of Rs.7,000/(1990-91 prices) has been assumed(after consultation with concerned officials) to be spent on materials in the form of fertiliser, insecticide etc.. Thereby the maintenance cost per annum is approximated as Rs.70,000/.

As far as the benefits are concerned, the primary benefit is derived from cashew-nut. With the production starting from 6th year onwards, and the total plantation area is being auctioned at certain rates every year, the per annum auction value is being estimated with the base of 1990-91. It is learnt that though production starts from 6th year of operation, the maximum output would flow during the period of 10-15 years of the plants. With the help of such flows the total benefits of the project for 40 years life span has been estimated to be Rs.75,00,000/.

The year-wise costs and benefits flows are shown in the financial cash-flow given in Table 8.2. With these estimated costs and benefits we have attempted to check the financial profitability in the next section.

8.3 Financial Analysis of the Project

Like the other projects, in this case too we have first of all estimated the total costs and the total benefits with the help of market prices of the base year and then arrived at the net benefit figures, which has been calculated as Rs.2,42,000/.

Table 8.2: Financial and Economic Estimates of Ranpur Cashew Project

(Figures in thousand rupees)

(I)

	1981-82	82-83	83-84	84-85	85-86	86-87	87-88	88-90
A.Cost								
Labour	1397 (558)	775 (310)	530 (212)	550 (220)	--	--	--	--
Material	590 (678.5)	235 (270.25)	320 (368)	341 (397)	--	--	--	--
Maintenance(L)	--	--	--	--	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)
Maintenance(M)	--	--	--	--	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)
Total Cost(90-91)	1988 (1237.5)	1010 (580.25)	850 (580)	891 (617)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)
B.Benefit								
Direct Benefit(Cashew)	--	--	--	--	--	200 (300)	250 (375)	300 (450)
C.Net Benefits	-1988 (-1237.5)	-1010 (-580.25)	-850 (-580)	-891 (-617)	-70 (-33.25)	130 (266.75)	180 (341.7)	230 (416.75)

cont.

(II)

	90-91	91-94	94-98	98-01	01-05	05-09	09-21	**Total**
A.Cost								
Labour	--	--	--	--	--	--	--	**3252 (1300.8)**
Material	--	--	--	--	--	--	--	**1486 (1708.75)**
Maintenance(L)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	**2268 (907.2)**
Maintenance(M)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	**252 (289.8)**
Total Cost(90-91)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	**7258 (4206.55)**
B.Benefit								
Direct Benefit(Cashew)	350 (525)	400 (600)	350 (525)	300 (450)	200 (300)	150 (225)	100 (150)	**7500 (11250)**
C.Net Benefits	280 (491.75)	330 (566.75)	280 (491.75)	230 (416.75)	130 (266.75)	80 (191.75)	30 (116.75)	**242 (7043.45)**

Note: The figures in parenthesis indicate the economic estimates of the same.

The figures in the table show that the total undiscounted cost is estimated to be Rs.72,58,000/ over the life-span of the project while the total undiscounted benefits are estimated to be Rs.75,00,000/. This establishes that financial net benefit is Rs2,42,000/ which is yielding a relatively low rate of return of 5% only on the capital invested on the project.

However, since the net benefit is the undiscounted benefit which does not reflect the true value of the project, next we have introduced the inter temporal variations with different rates of discount in the range 2-10%. On the basis of the discounted flows the decision criteria like NPV, BCR and IRR are estimated, which are provided in Table 8.3

Table 8.3: The NPV, BCR and IRR Estimates of the Ranpur Cashew Project (in terms of Financial considerations)

Rate of Discount	NPV	BCR	IRR
0	242	1.03	0%
2	-932	0.84	
5	-1949	0.62	
10	-2665	0.38	
12	-2782	0.32	

Note: Rate of discount and IRR in percentages; NPV in thousand rupees; BCR in number.

The results show that the project is not financially profitable because the NPV is negative at all positive rates of discount, only at 0% rate of discount the NPV of the project is found to be positive. The IRR is also calculated as 0% whereas BCR is just above 1 at 0% rate of discount. When we investigated into the possible causes of non-profitability of the project, we learnt that it is attributable to its long life span, output price distortions due to auctioning, imperfect input prices, thefts due to insufficient protection resulting in low benefit, and relatively high initial investments. But all those distortions are tackled when we moved into the economic evaluation of the project.

8.4 Economic Analysis of the Project

Since economic evaluation involves adjustment to the market imperfections in inputs and output prices through their economic/shadow prices, we have resorted to such adjustments in costs and benefits estimations.

As argued earlier that the labour component consists of nothing but the unskilled type, the shadow wage rate of 0.4W is being applied to take care of the labour market distortions. The labour component of maintenance cost is also adjusted similarly. The material cost component is divided into: saplings, fertiliser and implements. Unlike the previous two categories(SFP. Territorial plantations) here the saplings are produced by the Corporation itself, hence no adjustment is needed in the economic analysis. The implements are also not adjusted due to lack of any data. The fertiliser, which is available at 30% subsidy, prices are adjusted with economic price being 1.3 times that of the market values.

With regard to the adjustment in output prices, it may be noted that the project authorities resort to auctioning of the outputs every year at same quoted price. We have learnt from the officials and other knowledgeable persons that the auction rate has been very low compared to the market rate due to many factors like nepotism, favouritism and local political influences. In view of these distortions, we have approximated that the market rate, which is taken as economic price, is 1.5 times higher than the auction rate. We have also confirmed this with the help of our primary data that while the auction rate of raw cashew is in the order of Rs.20/ to Rs.25/, the market rate ranges between Rs.30/ to Rs.35/. Thus, with the economic price being 1.5 times that of the auction rate, we have estimated the economic value of benefits. All these economic adjustments are shown in the Table 8.2.

The figures in the Table show that after the economic adjustment, the total economic cost becomes Rs.42,06,550/ while the financial costs are Rs.72,58,000/. Similarly the economic benefit becomes Rs.1,12,50,000/ in comparison to the financial estimate of Rs.75,00,000/ and the net benefit increased by Rs.68,01,450/. Again when these streams of economic costs and benefits are discounted by the EDR of 11%, the NPV, BCR and IRR showed significant improvement. These results are provided in Table 8.4. These results establish that the project is economically very profitable.

Table 8.4: The NPV, BCR and IRR Estimates of Ranpur Cashew Project (in terms of Economic consideration)

Criteria	EDR 11%
NPV	-Rs.363,000/
BCR	0.86
IRR	9%

As it is clear from above that at 11% rate of discount the NPV is negative; though BCR is slightly high from financial analysis, but IRR is very low i.e.9%. Thus, the project is not economically feasible.

In the next step we have estimated the indirect benefits in the form of grass and fodder, which are added to the economic net benefit stream. As regards such calculation, be noted that unlike other plantations, we have estimated the grass as fodder benefit only, because cashew being an economic fruit, generally people are not allowed to enter the area freely for fuel collection or are not allowed cattle for grazing. Hence, the authorities allow the only grasses to be cut for cleaning purposes. In order to estimate the benefits flowing from the grasses to the community we have assumed a lump sum amount of Rs.2,000/ from 6th year onwards, which is based on our field survey findings. The same amount is added to the net economic benefit stream in terms of indirect benefits shown in Table 8.5. Therby the net socio-economic benefit becomes Rs.71,13,000/. Further, with a view to account for inter temporal variation, when we discounted the stream with 2% social discount rate and estimated the NPV, BCR and IRR improved to justify the project. Those values are shown in Table 8.6.

Table 8.5: Socio-Eco-Environmental Estimates of Ranpur Cashew Project

(Figures in thousand rupees)

	1981-82	82-83	83-84	84-85 (I)	85-86	86-87	87-88	88-90
A.Cost								
Labour	1397 (558)	775 (310)	530 (212)	550 (220)	--	--	--	--
Material	590 (678.5)	235 (270.25)	320 (368)	341 (397)	--	--	--	--
Maintenace (Labour)	--	--	--	--	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)
Maintenance (Material)	--	--	--	--	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)
Total Cost(90-91 prices)	1988 (1237.5)	1010 (580.25)	850 (580)	891 (617)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)
B.Benefit								
Direct Benefit(Cashew)	--	--	--	--	--	200 (300)	250 (375)	300 (450)
ind. Ben.(90-91)	--	--	--	--	--	2	2	2
Env.Benefits	--	--	--	10153	10153	10153	10153	10153
C.Net Benefits	-1988 (-1237.5)	-1010 (-580.25)	-850 (-580)	-891 (-617)	-70 (-33.25)	130 (266.75)	180 (341.75)	230 (416.75)
D. S-E Net Benefits	-1237.5	-580.25	-580	-617	-33.25	268.75	343.75	418.75
E. S-E-E Net Benefits	-1237.5	-580.25	-580	9536	10119.7	10421.75	10496.75	10571.75

cont.

(II)

	90-91	91-94	94-98	98-01	01-05	05-09	09-21	Total
A.Cost								
Labour	--	--	--	--	--	--	--	**3252 (1300.8)**
Material	--	--	--	--	--	--	--	**1486 (1708.75)**
Maintenance(L)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	63 (25.2)	**2268 (907.2)**
Maintenance(M)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	7 (8.05)	**252 (289.8)**
Total Cost(90-91)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	70 (33.25)	**7258 (4206.55)**
B.Benefit								
Direct Benefit(Cashew)	350 (525)	400 (600)	350 (525)	300 (450)	200 (300)	150 (225)	100 (150)	**7500 (11250)**
Indirect Ben.(90-91)	2	2	2	2	2	2	2	**70**
Env.Benefits	10153	10153	10153	10153	10153	10153	10153	**375661**
C.Net Benefits	280 (491.75)	330 (566.75)	280 (491.75)	230 (416.75)	130 (266.75)	80 (191.75)	30 (116.75)	**242 (7043.45)**
D. S-E Net Benefits	493.75	568.75	493.75	418.75	268.75	193.75	118.75	**7113.45**
E. S-E-E Net Benefits	10646.75	10721.75	10646.75	10571.75	10421.75	10346.75	10271.75	**382774.45**

Note: The figures in the parenthesis indicate the economic estimates of the same.

The last and important factor to be included in the analysis is the environmental factor. Since this project is a large one with 255 hectares and long life span of 40 years, the quantitative assessment of environmental benefits are quite expected to be large. With the per hectare per annum ecological benefits of Rs.56,880/, which is justified earlier, we have estimated the same for the present project. With survival rate of 70%, we have estimated the per hectare per annum ecological benefit as Rs.39,816/. By using this standard, we have calculated the total ecological benefits of the Ranpur project, which comes to be Rs.101,53,000 per annum which is then added to the net socio-economic benefit stream resulting in net socio-eco-environmental benefit of Rs.38,27,74,000/. Again with 2% SDR, when these net socio-eco-environmental benefit stream is discounted and the decision criteria of NPV increased by 59 times and BCR by 32 times. The IRR also increased dramatically from 9% to 123%. These estimates are shown in Table 8.6.

Table 8.6: The NPV, BCR and IRR Estimates of Ranpur Project (in terms of Socio-Economic-Environmental consideration)

(NPV in thousand rupees)

Stage	NPV	BCR	IRR
I. Socio-Economic Estimates	4268	2.16	9%
II. Socio-Eco-Environmental Estimates	252728	69.9	123%

A comparative analysis of these results reveal that the economic analysis at 11% EDR, the project is not feasible. The addition of fodder benefit to the stream also does not improve the result much. But the lowering of the discount rate has helped the project to be viable. By using the standard rate of discount of 2% for this project, the project becomes viable with the yardstick of NPV and BCR. But it is not feasible due to low IRR in economic terms. Moreover, the addition of environmental benefits has improved the results of the project to a great extent which are already explained above. Thus though the project is not profitable financially and economically, but socially it is quite viable.

CASE STUDY 2: EVALUATION of KADAMJHOLA 3 PROJECT

8.5 Brief History of Kadamjhola 3 Cashew Plantation Project

This is another cashew plantation project in Khurda division of Puri district managed by the Orissa State Cashew Development Corporation. It was established in 1981-82 over an area of 62 hectares. Before the project started the land was barren because the soil was not fit for agriculture nor there were irrigation facilities to make it productive for agriculture. However, it was realised by the Corporation that such land is fit for cashew development as it does not need much water. Thus, they decided to go for plantation and in the beginning 10,500 plants were planted and the survival rate was 70%.

8.6 Costs and Benefits of Kadamjhola 3 Project

As in Ranpur project, in calculation of costs the land costs are not included as it is a hilly terrain under the Government. But as per the data/information collected from the Corporation, the total costs of the project has been estimated to be Rs.20,47,000/(at 1990-91 prices), with the break up of Rs.7,88,000 on the labour component, and Rs3,59,000/ on the materials component. As in Ranpur project here also we have estimated the per month maintenance cost on the basis of the data collected from the field. The data reveals that there are only 3 persons who are in charge of maintenance of the project and they receive a monthly salary of Rs.625/ which results in a cost Rs.22,500/ per annum. Besides this labour component, Rs.2,500/ is being spent on materials per annum. The year-wise detailed figures are shown in Table 8.7.

Table 8.7: Financial Cost Estimates of Kadamjhola3 Cashew Project

(Figures in rupees)

Year	Labour Cost	Material Cost	Maintenance Cost		Total
			Labour	Material	
1981-82	3,39,000	1,43,000			4,82,000
82-83	1,88,000	57,000			2,45,000
83-84	1,28,000	77,000			2,05,000
84-85	1,33,000	82,000			2,15,000
85-2021	nil		22,500	2,500	25,000
Total	7,88,000	3,59,000	9,00,000		20,47,000

As far as benefits are concerned, the value of cashew is estimated as per the methodology adopted for the Ranpur project. Accordingly, the benefits are estimated to be Rs.22,00,000/ at 1990-91 prices over the life-span of the project.

8.7 Financial Analysis of the Project

The very first step of SBCA being financial analysis, here we have attempted to analyse the project's profitability at market prices. The financial cash-flow showing yearly costs and benefits are shown in the Table 8.8.

Table 8.8: Financial and Economic Estimates of Kadamjhola 3 Cashew Project

(Figures in thousand rupees)

(I)

	1981-82	82-83	83-84	84-85	85-86	86-89	89-91
A.Cost							
Labour	339 (135)	188 (75.2)	128 (51.2)	133 (53.2)	–	–	–
Material	143 (164.4)	57 (65.55)	77 (88.55)	82 (94.3)	–	–	–
Maintenace (Labour)	–	–	–	–	22.5 (9)	22.5 (9)	22.5 (9)
Maintenance (Material)	–	–	–	–	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)
Total Cost(90-91 prices)	482 (300)	245 (140.75)	205 (139.7)	215 (147.5)	25 (11.87)	25 (11.87)	25 (11.87)
B.Benefit							
Direct Benefit (Cashew)	–	–	–	–	–	50 (75)	75 (112.5)
C.Net Benefits	-482 (-300)	-245 (-140.75)	-205 (139.75)	-215 (-147.5)	-25 (-11.87)	25 (63.12)	50 (100.62)

cont.

(II)

	91-94	94-96	96-98	98-01	01-21	Total
A.Cost						
Labour	--	--	--	--	--	788 (315.2)
Material	--	--	--	--	--	359 (412.8)
Maintenace (Labour)	22.5 (9)	22.5 (9)	22.5 (9)	22.5 (9)	22.5 (9)	810 (324)
Maintenance(Material)	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)	90 (103.5)
Total Cost(90-91 prices)	25 (11.87)	25 (11.87)	25 (11.87)	25 (11.87)	25 (11.87)	2047 (1155.55)
B.Benefit						
Direct Benefit (Cashew)	100 (150)	90 (135)	85 (127.5)	75 (112.5)	50 (75)	2200 (3300)
C.Net Benefits	75 (138.12)	65 (123.12)	60 (115.62)	50 (100.62)	25 (63.12)	153 (2144)

Note: The figures in the parenthesis indicate the economic estimates of the same.

An examination of the figures in the above table shows that total financial costs and benefits would be Rs.20,47,000/ and Rs.22,00,000/ respectively. As in other projects here also first we have calculated the net benefit which is estimated to be Rs.1,53,000/. Since all the figures are already estimated in 1990-91 prices, there is no need to introduce inflationary adjustment. However in order to account for the inter temporal variation we have calculated the net present value and benefit cost ratio at different rates of discount. The estimates are given below in Table 8.9.

Table 8.9: The NPV, BCR and IRR Estimates of Kadamjhola 3 Project (in terms of Financial consideration)

Rate of Discount	NPV	BCR	IRR
0	153	1.07	1%
2	-218	0.87	
5	-510	0.62	
10	-689	0.37	
12	-713	0.31	

Note: Rate of discount and IRR in percentages; NPV in thousand rupees; BCR in number.

The discounted cash flow analysis shows negative NPVs at all positive rates of discount. The NPV is positive only at 0% rates of discount. The BCR is also less than one at any positive rates of discount except 0%. The IRR is seen to be 1% which implies non-profitability of the project.

However, in the next step we have extended the analysis from economic point of view where market imperfections are corrected to some extent.

8.8 Economic Analysis of the Project

In order to carry the economic analysis, we have introduced the adjustments in tune with other cashew project. The prices of unskilled labour is gauged in terms of shadow wage, which is approximated as 0.4W(where W is the market wage rate); the economic price of materials being taken as 1.3 times the market price. In addition to these cost adjustments, the economic price of cashew is taken as 1.5 times that of the auction price. With the help of these adjustments, the economic cash-flow is estimated which is also provided in the Table 8.8.

The economic adjustment has resulted in higher net benefits, i.e. with reductions of total cost from Rs.20,47,000/ to Rs.11,55,000/ and with increase in total benefits from Rs.22,00,000/ to Rs.33,00,000/, the net benefit has increased by Rs.21,44,450/. Thus the net economic benefits have gone up by 14 times that of the net financial benefits. This net economic benefit stream when discounted with 11% EDR the NPV became negative and the BCR less than one. The IRR(9%) though positive was less than the market rate of interest. These estimates prove that the Kadamjhola 3 project is not economically viable.

Table 8.10: The NPV, BCR and IRR Estimates of Kadamjhola 3 Project (in terms of Economic considerations)

Criteria	EDR(11%)
NPV	-Rs.1,02,000/
BCR	0.84
IRR	9%

In the next step of our exercise we have added the indirect benefits in the form of fodder. As described in the other cashew project, for this kind of estimation we have assumed a lump sum value of Rs.500/ per annum from 6th year onwards till the end. The inclusion of these benefits led to rise in net economic benefits.

Finally, to undertake the socio-eco-environmental analysis, we introduced the environmental benefits. Resorting to the methods adopted in Ranpur project we have estimated the environmental benefits which would be Rs.24,68,000 per annum. These estimates are provided in Table 8.11.

Table 8.11: Socio-Economic-Environmental Estimates of Kadamjhola 3 Cashew Project

(I)

(Figures in thousand rupees)

	1981-82	82-83	83-84	84-85	85-86	86-89	89-91
A.Cost							
Labour	339 (135)	188 (75.2)	128 (51.2)	133 (53.2)	--	--	--
Material	143 (164.4)	57 (65.55)	77 (88.55)	82 (94.3)	--	--	--
Maintenace(L)	--	--	--	--	22.5 (9)	22.5 (9)	22.5 (9)
Maintenance(M)	--	--	--	--	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)
Total Cost(90-91)	482 (300)	245 (140.75)	205 (139.7)	215 (147.5)	25 (11.87)	25 (11.87)	25 (11.87)
B.Benefit							
Direct Benefit(Cashew)	--	--	--	--	--	50 (75)	75 (112.5)
Indirect benefits	--	--	--	--	--	0.5	0.5
Environmental benefits	--	--	--	2468	2468	2468	2468
C.Net Benefits	-482 (-300)	-245 (-140.75)	-205 (-139.75)	-215 (-147.5)	-25 (-11.87)	25 (63.12)	50 (100.62)
D. S-E Net Benefits	-300	-140.75	-139.75	-147.5	-11.87	63.62	101.12
E. S-E-E Net Benefits	-300	-140.75	-139.75	2320.5	2456.13	2531.62	2569.12

cont.

(II)

	91-94	94-96	96-98	98-01	01-21	Total
A.Cost						
Labour	–	–	–	–	–	**788** (315.2)
Material	–	–	–	–	–	**359** (412.85)
Maintenace(L)	22.5 (9)	22.5 (9)	22.5 (9)	22.5 (9)	22.5 (9)	**810** (324)
Maintenance(M)	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)	2.5 (2.87)	**90** (103.5)
Total Cost(90-91 prices)	25 (11.87)	25 (11.87)	25 (11.87)	25 (11.87)	25 (11.87)	**2047** (1155.55)
B.Benefit						
Direct Benefit(Cashew)	100 (150)	90 (135)	85 (127.5)	75 (112.5)	50 (75)	**2200** (3300)
Indirect benefits	0.5	0.5	0.5	0.5	0.5	**17.5**
Environmental benefits	2468	2468	2468	2468	2468	**91316**
C.Net Benefits	75 (138.12)	65 (123.12)	60 (115.62)	50 (100.62)	25 (63.12)	**153** (2144)
D. S-E Net Benefits	138.62	123.62	116.12	101.12	63.62	**2161.95**
E. S-E-E Net Benefits	2606.62	2591.62	2584.12	2569.12	2531.62	**93477.95**

Note: The figures in the parenthesis indicate the economic estimates.

With the help of all these recalculated cost and benefit figures, we attempted to estimate NPV and BCR with 2% SDR and then to estimate IRR. These estimates are contained in Table 8.12.

Table 8.12: The NPV, BCR and IRR Estimates of Kadamjhola 3 Project (in terms of Socio-Economic-Environmental Considerations)

(NPV in thousand rupees)

Stage	NPV	BCR	IRR
I. Socio-Economic Estimates	1240	2.26	9%
II. Socio-Eco-Environmental Estimates	61636	64.08	123%

An overall analysis of the results show that the addition of fodder benefit could not much influence the profitability condition; on the other hand, the lowering of discount rate from 11% to 2% SRD the NPV became positive. With 2% SRD the NPV is estimated to be Rs.12,40,000/ and BCR as 2.26 indicating the social viability of the project. However, the IRR is still low at 9%. But the results are completely changed when we added the environmental benefits. While the NPV increased by almost 50 times, the BCR went up by more than 28 times. These results establish that the project is highly profitable from socio-eco-environmental point of view.

8.9 Concluding Observation

Though both the cashew development projects, of the Orissa State Cashew Development Corporation, are not feasible financially and economically; but, from socio-economic point of view those are quite viable. Further when the environmental aspects are incorporated into the calculations, the viability has increased to a great extent. The possible reasons behind low financial benefit are that the auction prices of cashew are low, and proper care is not being given into the protection, as well as to the harvest aspect. Moreover, the local people are not satisfied with the officials approach of auctioning it to parties from outside the area. They have no involvement in those projects and hence, do not care for its protection. On the other hand, in any slightest opportunity they come forward to cut the plants for fuel purposes. Hence, we would like to conclude that in oder to improve the financial and economic viability of the project, the Cashew Development Corporation should solicit the co-operation of the local population and also the Corporation should adopt new managerial methods to improve the productivity of the plants, whereby the revenue earnings of the Corporation would increase.

Chapter 9

SBCA OF PLANTATION PROJECTS: CASE STUDIES OF INDUSTRIAL PLANTATIONS, ORISSA

9.0 Introduction

In the last three chapters we have already examined the SBCA results of three varieties of plantations, namely, Social Forestry, Block Plantation, and Cashew Plantations in Orissa, which are also managed by three different organisations. Owing to the environmental awareness and strict environmental regulations, the industries have been motivated and advised to undertake plantation schemes. Moreover, the National Forest Policy, 1988 has laid emphasis on industrial plantations. According to the Policy, industries depending upon forest products must produce their own raw materials and those industries which acquire forest land must adhere to the policy of compensatory afforestation scheme, under which they have to afforest that much area that they have deforested for their establishment purpose. Moreover, industries were advised to develop plantations to green the surrounding area in order to abate pollution created by their production process. In view of these policy changes many large industries of Orissa had undertaken afforestation/plantation schemes. As stated in our methodology of sample selection for comparative study we have taken industrial plantation as one variety of plantation scheme. As discussed in chapter 5, since such type of plantation projects are not available in the district Puri, we have selected two projects from the nearby districts and those projects are the plantation undertaken by the National Aluminium Company (NALCO) in Angul(formerly in Dhenkanal district) and Ballarpur Industries Limited (BILT) in Cuttack district of Orissa. When the NALCO's objectives involved in plantation has been to improve the surrounding environment, the BILT is involved to augment its raw material supply. After presenting a brief history of both projects and the plantation programmes, we have undertaken a financial analysis to establish the commercial viability and then extended the analysis in terms of an economic analysis as well as social benefit-cost analysis to examine the social acceptability/viability.

Case Study 1: EVALUATION of PLANTATION UNDERTAKEN by NALCO

9.1 Brief History of the Project

With the establishment of the NALCO Aluminium and Power Complex near Angul of former Dhenkanal district of Orissa, the environment of the region has undergone a rapid change. The transformation from a predominantly rural agricultural economy to industrial one has been sudden and tremendous. The construction activities, which started in 1982, had witnessed heavy conglomeration of men and materials. With a short span of one year major chunks of land was made available. These were mainly agricultural land and there was no forest growth in the area. Whatever trees were available on the lands, land owners removed the same in no time. In the wake of establishment of the smelter plant and its captive power plant, the eco-system/ natural environment became first casualty. In order to abate the environmental degradation and to check air pollution, the company decided to go for massive plantation programme. It was also expected that the plantation will provide a green cover to the surrounding lands which were bereft of any vegetation.

The plantation activities were strengthened during the 1990s due to the pressure from the various quarters. Hence, during the last seven years the NALCO has made significant contribution to the protection of flora and fauna in and around its factories. It has launched a 100-crore rupees programmes to control pollution and to provide intensive plantation in township and peripheral area, create green belt around its factories and develop parks in the township.

Though the NALCO is seriously involved in annual plantation, we have decided to evaluate the scheme which was undertaken in 1985 covering 8 hectares of land inside its captive power plant. They had planted with 10,000 casuarina plants on the earmarked sites and after 7 years i.e. in 1993-94 that patch of plantation had been harvested after attaining maturity. Since the objective of plantation was purely environmental, the harvest was not accorded much importance. Also the interim harvest of fuel were being distributed for various purposes like festivals in the campus community, marriages etc. However, the survival rate of the plants was very high, i.e. 84%

9.2 Costs and Benefits of the Project

I. Cost Estimates

The costs of industrial plantation are of two categories: capital costs and variable costs. The capital costs of the project is the land cost and other fixed cost like establishment cost etc. The variable costs of the plantation project included labour cost, material cost and maintenance cost. The costs of the project under consideration are estimated by us on the basis of another project appraisal report which has been undertaken in 1995-96. Thus, our estimated cost figures for the sample project are based on 1995-96 prices. The various cost components are discussed below.

(i) Land Costs: The land used for plantation by the NALCO was acquired for industrial activity. From the point of view of plantation activity it commands no costs because it was already purchased for the industry as a whole. The company has the right to decide about the proper utilisation of the land. It may be assumed that the land used for casuarina plantation might have remained unutilised as generally vast area inside plants/industries remain idle for long periods.

(ii) Establishment Costs: The Department of Horticulture is the administrative body of the NALCO which is in charge of our sample project. The department has been established for a broader goal with various activities like controlling pollution, providing intensive plantation in township and peripheral area, creating green belt around its factories, and developing parks in the townships. It has been annual target and to achieve its target it has been involved in annual plantation since 1984-85.

In this study we have evaluated only one patch of plantation which was undertaken in 1985-86. Since the total establishment cost of this department cannot be broken down easily, we have assumed(the assumption being based on concerned officials statement) that ten percent of the total establishment cost may be attributed as the cost of this project. Accordingly, amount is estimated to be Rs.15,000/.

(iii) Labour cost: The labour component consists of skilled and unskilled part; the skilled part is the administrative one. As it is already accounted in the establishment cost, here we have considered only the unskilled part. An examination of the costs incurred in 1985-86 revealed that Rs.10,000/ was spent as labour component, which increased to Rs.33,000/

in 1986-87and Rs.20,000 in 1987-88. The plantation activities involved no unskilled labour after third year.

(iv) Material Costs: Generally plantation projects are labour-intensive for which no great amount of material is needed. The materials which are needed for such kind of projects are nothing but seedlings, saplings, fertiliser, insecticides, and implements. In the first year of operation an amount of Rs.5,000/ was spent on materials; in the second year Rs.13,000/ was spent and in the third year Rs.3,000/ was spent(shown in Table 9.1). However, the component wise figures were not available to us.

(v) Operation & Maintenance Costs: As regards the operation and maintenance is concerned, maintenance is required after three years to watch and ward, weeding and pruning, and in using the materials like fertiliser and insecticides. Since the watch and ward was performed by semi-skilled personnel employed in the Horticulture unit, only unskilled labour are employed for weeding and pruning operations. The departmental data show that from fourth year onwards an amount of Rs.18,000/ had been spent on maintenance out of which Rs.8,000/ was spent on semi-skilled personnel, Rs.8,000 on unskilled part, and Rs.2,000 was spent on fertiliser and insecticide. All these costs are indicated in Table 9.1.

Table 9.1: Financial Costs of Plantation Project of the NALCO

(Figures in rupees)

Years	Establishment Cost	Labour Cost	Material Cost	Maintenance(Material)	Maintenance(skilled)	Maintenance(unskilled)	Total
1985-86	15,000	10000	5000	nil	nil	nil	**30,000**
1986-87		33000	13000	nil	nil	nil	**46,000**
1987-88		20000	3000	nil	nil	nil	**23,000**
1988-94 (per annum)		nil	nil	2000	8000	8000	**108,000**
Total	15000	63000	21000	12000	48000	48000	**207,000**

Source: Estimated by us on the basis of another sample project appraisal report collected from the concerned office of the NALCO.

II. Benefit Estimates

It is already described earlier that the casuarina plantation by the NALCO was undertaken for environmental purposes; hence the material benefit aspects of the project were not of much importance. Still after seven years of its operation and maintenance, in 1993-94, the NALCO auctioned those trees for a lump sum amount of Rs.45,000/. Besides these

figures there are no other data available regarding the interim benefits received by the project authorities.

As our objective has been to evaluate the projects through SBCA, we have analysed the NALCO plantation in terms of financial, economic and socio-economic angles.

9.3 Financial Analysis of the Project

We have already presented above the cost components and benefits derived from the project. In order to undertake the exercise the financial cash-flows were worked out, which are provided in Table 9.2.

Table 9.2: Financial and Economic Estimates of the Plantation Project of NALCO

(Figures in thousand rupees)

Cost/Benefits	1985-86	86-87	87-88	88-93 (per annum)	93-94	Total
A. Costs						
1.Establishment Cost	15 (15)					15 (15)
2.Labour	10 (4)	33 (13.2)	20 (8)	--	--	63 (25.2)
3.Material	5 (5.75)	13 (14.95)	3 (3.45)	--	--	21 (24.15)
4.Maintenance (Material)	--	--	--	2 (2.3)	2 (2.3	12 (13.8)
Maintenance (Skilled Labour)	--	--	--	8 (8)	8 (8)	48 (48)
Maintenance (Unskilled Labour)	--	--	--	8 (3.2)	8 (3.2	48 (19.2)
Total(95-96)	30 (24.75)	46 (28.15)	23 (11.45)	18 (13.5)	18 (13.5	207 (145.35)
Total(90-91 prices)	18.15 (14.97)	27.83 (17.03)	13.91 (6.92)	10.89 (8.16)	10.89 (8.16	125.235 (87.936)
B. Benefits						
Timber	--	--	--	--	45	45
Total(MP)	--	--	--	--	45	45
Total(90-91)	--	--	--	--	33.165 (40.461)	33.165 (40.461)
C. Net Benefit	-18.15 (-14.97)	-27.83 (-17.03)	-11.63 (-6.92)	-10.89 (-8.16)	22.275 (32.29)	-92.07 (-47.47)

Note: The figures in the parenthesis show the economic estimates of the same.

As we have already discussed, the plantation project by NALCO is purely environmental; there is no expectation for material benefits. Only when the trees are matured, those are sold in the market. The total costs and benefit figures show that while the total costs incurred by the NALCO had been Rs.2,07,000/, the total financial benefits had been Rs.45,000/. Thus, it results in negative net benefit.

Since the figures were in different prices, we have deflated the costs to 1990-91 level by the factor 0.605 and benefits were deflated with the factor 0.805. After the price adjustment the net benefits are found out to be -Rs.92,070 , which implies that the project has no economic value. Still we have discounted the cash-flows at different rates of discount and calculated the decision criteria like NPV, BCR and IRR the results of which are shown in Table 9.3.

Table 9.3: The NPV, BCR and IRR Estimates of the NALCO Plantation Project (in terms of Financial consideration)

Rate of Discount	NPV	BCR	IRR
0	-92.07	0.26	---
2	-87.3	0.24	
5	-80.9	0.20	
10	-71.5	0.16	
12	-68.3	0.14	

Note: Rate of discount and IRR in percentages; NPV in thousand rupees; BCR in number

The figures of the table show that the NPV is continuously negative, BCR is also less than one and IRR is indeterminate. However, in order to adjust market distortions we have attempted to analyse the performance of the project economically which is the second step of SBCA.

9.4 Economic Analysis of the Project

It is well argued in the SBCA literature that there are distortions in the market prices of inputs and outputs. Thus in order to accomplish economic analysis, the market prices are ought to be substituted by shadow prices. As discussed in the methodology chapter, inorder to take care of the imperfections in labour market, the shadow wage rate(SWR) for unskilled labour is taken as 0.4W(where W is the market wage rate). When the SWR for unskilled labour was introduced the market cost of unskilled labour, which was Rs.63,000/, reduced to Rs.25,200/. Similarly with introduction of SWR of unskilled labour

in the maintenance cost component, those costs reduced by 60%(i.e. from Rs.48,000/ to Rs.19,200/). All these changes are indicated in Table 9.2.

We have already mentioned that the materials for a plantation project consist of saplings, fertilisers and implements. In the absence of component wise data, we have assumed from our field experiences that 50% of total material cost is being spent on fertilisers, 30% on saplings and 20% on implements. Unlike SFPs and territorial plantations here there is no subsidy for saplings as the industries produce the saplings on their own. So the only subsidised component is fertiliser. Since the subsidy on fertiliser has been 30%, additional weight of 30% is assigned in calculating the economic price of fertiliser.

As far as outputs are concerned, the market price of timber is observed to be 1.22 times more than that of the auction rate. Hence the economic price of timber is taken as 1.22 times of the auction rate. With these adjustments, the net economic benefit stream is estimated which are shown in Table 9.2. When the total economic cost(90-91 prices) are estimated to be Rs.87,936/, the total economic benefit(90-91 prices) are estimated to be Rs.40,461/ resulting in negative net benefit. To complete the procedure we have discounted the net economic benefit stream with 11% discount rate and the results are shown below.

Table 9.4: The NPV, BCR and IRR Estimates of the NALCO Project (in terms of Economic consideration)

Criteria	EDR 11%
NPV	-Rs.41.800/
BCR	0.21
IRR	indeterminate

Thus, at 11% EDR the economic NPV is seen to be negative and BCR is estimated to be 0.21 implying economic non-viability of the project. In economic terms the IRR is obviously indeterminate.

To this economic net benefit we have added indirect benefits in the form of fuel. We have learnt from the officials we have learnt that the fuels are being used for different

purposes like uses in the campus temple, for marriages, funerals of campus people etc. We have collected the data regarding the quantity of availability of fuel from five hectare of plantation following the CVM. Accordingly we have estimated the net benefits of the plantation project and then following exactly similar exercise we have added to the benefit stream which are shown in Table 9.5. With the addition of Rs.15,120 as indirect fuel benefit the net socio-economic benefit becomes -Rs.32,350/.

Table 9.5: Socio-Eco-Environmental Estimation of the NALCO Plantation Project

(Figures in thousand rupees)

Cost/Benefits	1985-86	86-87	87-88	88-89	89-90	90-93	93-94	Total
A. Costs								
1. Establish ment Cost	15 (15)							**15 (15)**
2.Labour	10 (4)	33 (13.2)	20 (8)	–	–	–	–	**63 (25.2)**
3.Material	5 (5.75)	13 (14.95)	3 (3.45)	–	–	–	–	**21 (24.15)**
4.Maintenance(Material)	–	–	–	2 (2.3)	2 (2.3)	2 (2.3)	2 (2.3)	**12 (13.8)**
Maintenance(Skilled Labour)	–	–	–	8 (8)	8 (8)	8 (8)	8 (8)	**48 (48)**
Maintenance(Unskilled Labour)	–	–	–	8 (3.2)	8 (3.2)	8 (3.2)	8 (3.2)	**48 (19.2)**
Total(95-96)	30 (24.75)	46 (28.15)	23 (11.45)	18 (13.5)	18 (13.5)	18 (13.5)	18 (13.5)	**207 (145.35)**
Total(90-91 prices)	18.15 (14.97)	27.83 (17.03)	13.91 (6.92)	10.89 (8.16)	10.89 (8.16)	10.89 (8.16)	10.89 (8.16)	**125.235 (87.936)**
B. Benefits								
1.Timber	–	–	–	–	–	–	45	**45**
Total(MP)	–	–	–	–	–	–	45	**45**
Total(90-91)	–	–	–	–	–	–	33.165 (40.461)	**33.165 (40.461)**
Indirect Benefit(90-91)	–	–	–	1.44	2.16	2.88	2.88	**15.12**
Env.Benefit(90-91)	–	–	–	386	386	386	386	**2316**
C.Net Benefit	-18.15 (-14.97)	-27.83 (-17.03)	-11.63 (-6.92)	-10.89 (-8.16)	-10.89 (-8.16)	-10.89 (-8.16)	22.275 (32.29)	**-92.070 (-47.47)**
D.S-E Net Benefit(90-91)	-14.97	-17.03	-6.92	-6.72	-6.0	-5.28	35.17	**-32.35**
E.S-E-E Benefit(90-91)	-14.97	-17.03	-6.92	379.28	380	381.28	421.17	**2283.65**

Note: The figures in the parenthesis show the economic estimates of the same.

Still some environmental factors are not included in our analysis. Since the objective of this project has been environmental improvement, some of those aspects should be included in the analysis; otherwise the analysis will be incomplete. In order to include some of those environmental benefits we have followed the same procedure as adopted for other projects, i.e. the unit environmental benefit is approximates as Rs.56,880/ per hectare per annum. Since the survival rate of the plants of NALCO were nearly 85%, we have recalculated the benefits accordingly and estimated that the environmental benefits flowing from the project would be Rs.3,86,000/ per annum. When this value was added to the net socio-economic benefit stream(shown in Table 9.5), the net social benefit improved and it becameRs.22,83,600

In conformity with our argument, by using 2% SDR, the decision criteria like NPV and BCR are estimated and the socio-economic IRR is also estimated which are presented below.

Table 9.6: The NPV, BCR and IRR Estimates of NALCO Project (in terms of Socio-eco-environmental considerations)

(NPV in thousand rupees)

	Stage	NPV	BCR	IRR
I.	I. Socio-Economic Estimates	-33.61	0.58	---
II.	II. Socio-Eco-Environmental Estimates	2003	25.83	198%

An examination of the estimates given in Table 9.6 the addition of fuel benefits has have little influence on the profitability conditions as the NPV even at 2% SDR remained negative, and BCR still less than one as well as the IRR being indeterminate. Only when the environmental benefits are added with the socio-economic benefits the results improved remarkably. The NPV which was negative(i.e. -Rs.33,610/) became very high(i.e. Rs.20,03,000/) and the BCR raised by around 45 times. The IRR improved 198%.

Thus it may be concluded though financially and economically the project was not profitable, but socio-eco-environmental analysis shows the project as quite viable at 2% SRD. This also proves that since the project was aimed at environmental improvement, the socio-economic analysis incorporating the environment factors is the proper way to examine the viability of the project.

Case Study 2: EVALUATION of PLANTATION by the BALLARPUR INDUSTRIES Ltd

9.5 Brief History of the Project

The Ballarpur Industries Limited(BILT) under the Thaper Group of industries is a multi-product firm. Among its products paper is major one. The firm took over the erstwhile Titagarh Paper Mills located at Choudwar, Cuttack district of Orissa and continued the production of paper by using wood and bamboo as the main raw material. But with scarcity of raw materials due to increase demand, it became difficult for BILT in getting good quality of wood. In order to overcome those problems in 1991 the management decided to set up one nursery in Choudwar to supply seedlings to the farmers who in turn would supply the raw materials to the mill when ready. The main varieties of seedlings were eucalyptus, acacia, chakunda, and bamboo. The farmers were motivated to plant those in their fallow land. On the condition that they will be given a rental of Rs.625/ per acre every year which was agreed upon to be hiked by Rs.125/ after every 7 years. On the other hand, the farmers were asked to take care of those plants and after 7 years they were supposed to sell the wood to the BILT at the market price.

Again in 1993 the BILT decided to set up another ultra model nursery and through that nursery distributed 26lakh seedlings per annum. This time they changed the norm that the farmers were allowed to sell the products to whomever they wish. The benefit for the BILT was that at least raw materials were available nearer to their industry and that they could rely on the quality. As far as farmers were concerned, they were highly benefited as they were getting seedlings at a very low subsidised rate(i.e. twenty paise per seedling

while real cost was Rs.1.20), making productive use of their fallow land and getting good amount of return after harvest. The survival rate of their plants was also high i.e. 73%. In addition to these efforts, the BILT also undertook massive plantation around its mill and township. Further it purchased private land for plantation activities.

However, so far as our study is concerned we have taken up a patch of plantation which the BILT itself had undertaken in 1990 over a patch of 60 hectares of land which was purchased by them at a cost of Rs.23.5 lakh from the nearby farmers. Since the land was not much productive, the Company utilised for plantation of eucalyptus and bamboo which are needed for their raw materials. It was reported to us that in 1997 there were 1,50,000 plants with a survival rate of 85%. The life of these trees are estimated to be 7 to 8 years.

While the evaluation of plantations by the NALCO was in ex-post sense, the evaluation of plantation of the BILT has been an exercise in ex-ante sense as the project is yet to complete its life span. Hence, the final harvest of the BILT is an approximation, which is based on the information collected from the concerned officials. Other figures of costs and benefits are collected from the office of the Mill at Choudwar. In order to carry the SBCA exercise we have followed the same pattern that we have followed in other projects i.e. financial, economic, and socio-economic analysis.

9.6 Costs and Benefits of the Project

The costs of the project include land cost, establishment cost and insurance cost as fixed cost and labour cost, material cost and maintenance cost as variable cost. Each of these cost components are elaborated below.

(i)The Land Cost: As mentioned above, the BILT had purchased 60 hectares of land from the farmer to undertake its own plantation scheme to augment its raw material supply. Since the land purchased by it was not very productive and not fit for agriculture, they could purchase it at a relative low rate of Rs.15,600/ per acre on an average. But the total cost incurred by the BILT was Rs.23,50,000/ for acquiring the land.

(ii)The Establishment Cost: The raw materials division of the industry is in charge of plantation activities. Since there are no data available regarding the establishment cost, on the basis of our discussion with the officials we have assumed 2% of the total cost as the establishment cost. This cost includes the planning, monitoring and management of the plantation activities in the beginning of the programme. Accordingly, it is estimated that the establishment costs might have been Rs.1,16,000/ for the plantation project of BILT.

(iii) The Insurance Cost: Plantations are generally very much prone to risk factor like natural calamity, floods, cyclone, various diseases etc. In order to reduce the risk and also a measure of precaution the BILT had spent a good amount of Rs.3,00,000/ in insurance. We have accounted this in our financial analysis, but as we move to socio-economic analysis it is being ignored as insurance is one type of transfer payment only.

(iv) The Labour Cost: The labour component is divided into two parts: skilled and unskilled. Generally plantation programmes by industries are undertaken with care under proper supervision by the managerial staff. Besides, the strict environmental standards and environmental audit system, as prescribed by the Government of India, Ministry of Forests and Environment, have forced the industry managers to accord priorities to plantation activities. But all those supervisory costs are included in the skilled labour only. The rest is unskilled part. Since the skilled labour part is already taken into consideration in the establishment part, whatever data available on labour head, are attributable to unskilled labour only.

The data collected from the BILT shows that in the first year of operation(i.e. 1990-91), the labour cost was Rs.3,00,000/, the material cost was Rs.1,00,000/, establishment costs was Rs.1,16,000/ and Insurance cost was Rs.3,00,000. Thereby the total cost was Rs.31.66 lakh in the first year of operation; but total cost in the second year was Rs.9.06 lakh including labour(Rs.5,56,000/) and material(Rs.3,50,000/); in the third and fourth year it was Rs 3 lakh; from 5th year onwards only maintenance cost was there, Rs 2 lakh was spent on 5th year while from 6th year onwards Rs 3 lakhs had been estimated to be spent. In total an amount of Rs.57,72,000/ has been estimated to be spent for that 60

As we have already discussed, the plantation project by the BILT is primarily aimed at supplying the raw materials to the Mill. Therefore, hence it is obvious that the project is being monitored and managed properly. A good amount of fertilisers, and insecticides are being applied in a way to take precaution from risk of diseases, etc. In view of these precautionary measures, the cost of the project has been very high i.e. over the years the total financial cost has been estimated to be Rs.57,72,000/ including labour, material, maintenance and other costs.

Table 9.8: Financial and Economic Estimates of Plantation Project by the Ballarpur Industries Ltd.

(Figures in thousand rupees)

Cost/Benefits	1990-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	Total
A.Costs	2350								
1.Land	(822.5)								
2.Establis	116								
ment Cost	(116)								
3.Insuranc	300								
e	(0)								
4.Labour	300	556	200	100	--	--	--	--	1156
	(120)	(222.4)	(80)	(40)					(462.4)
5.Material	100	350	100	--	--	--	--	--	550
	(115)	(402.5)	(115)						(632.5)
6.Mainten	-	--	--	80	80	120	120	120	520
ance(Mate				(92)	(92)	(138)	(138)	(138)	(598)
rial)									
Maintenan	--	--	--	24	24	36	36	36	156
ce(Skilled				(24)	(24)	(36)	(36)	(36)	(156)
Labour)									
Maintenan	--	--	--	96	96	144	144	144	624
ce(Unskill				(38.4)	(38.4)	(57.6)	(57.6)	(57.6)	(249.6)
ed Labour)									
TC(MP)	3166	906	300	300	200	300	300	300	5772
	(1173.5)	(624.9)	(195)	(194.4)	(154.4)	(213.6)	(213.6)	(213.6)	(3037)
TC(90-91	3166	796.37	239.4	221.1	133	181.5	172.8	172.8	5082.9
prices)	(1173.5)	(549.28)	(155.6)	(143.27)	(102.67)	(140.1)	(133.4)	(133.4)	(2531.2)
B.Benefit									
1.Timber	--	--	--	--	--	--	--	15750	15750
Total(MP)	--	--	--	--	--	--	--	15750	15750
Total(90-91)	--	--	--	--	--	--	--	8552 (10690)	8552 (10690)
C.Net Benefit	-3166 (-1173.5)	-796.3 (-549.2)	-239.4 (-155.6)	-221.1 (-143.2)	-133 (-102.6)	-181.5 (-140.1)	-172.8 (-133.4)	8379 (10556)	3469 (8159)

Note: The figures in the parenthesis indicate the economic estimates of the same.

Since the cost figures were based on the current market prices, we have deflated those to 1990-91 level by the whole sale price indices(discussed in the methodology chapter). After proper adjustment, the total costs have been reduced to Rs.50,82,974/. Similarly The financial benefits are also deflated to the base year and the total benefits have been Rs.85,52,250/. By the crude manner, the net benefit are estimated to be Rs.34,69,276/. By adhering to the DCF method, we have discounted the net benefit stream with different discount rates and estimated the decision making criteria of NPV, BCR and IRR, which are shown in Table 9.9.

Table 9.9: The NPV, BCR and IRR Estimates of Plantation Project by the BILT (in terms of Financial consideration)

Rate of Discount	NPV	BCR	IRR
0	3469	1.68	9%
2	2420	1.49	
5	1183	1.25	
10	-232	0.94	
12	-634	0.84	

Note: Rate of discount and IRR in percentages; NPV in thousand rupees; and BCR in number.

The financial estimates of the BILT plantations show that the NPV is quite encouraging upto 5% rate of discount. While the NPV is Rs.24,20,000/ at 2% SDR, it is Rs.11,83,000/ at 5% rate of discount. The NPV becomes negative at 10% rate of discount. Correspondingly the BCR is more than one at 2% and 5% discount rates, but it is less than one at 10% and 12% discount rate. The financial IRR is seen to be 9% which is less than market rate of interest. Thus, financially the project is viable only at low rates of interest, i.e. in the range of 0-9%.

As the second step of SBCA, the economic analysis follows the financial one.

9.8 Economic Analysis of the Project

In the economic analysis we have made price adjustment regarding the value of land, establishment cost, skilled labour cost and unskilled labour part of maintenance cost. The economic values of these components are being estimated as follows.

In order to measure the social costs of land in terms of opportunity foregone, the land can be divided into various categories, such as, village sites, low-medium and high cultivable land, orchards, wastelands, forests and others. With the net productivity per acre for each category of land and with the total area of each category the total losses to the society in terms of productivity foregone can be worked out. Following this procedure Rath(1980) had estimated the social cost of land as nearly 10% of the financial cost per annum. However, our sample project is based on single type low fertile land and hence we have approximated the total social cost as 35% of the total financial cost. In addition to this in the economic analysis the insurance component is ignored as it is one form of transfer payment and as per the UNIDO Guidelines the transfer payments are not accounted in the economic analysis. As far as establishment cost is concerned, no adjustment has been made regarding this component as the financial cost itself is taken as the economic cost.

The labour cost is treated in the very similar manner as in other projects i.e, assigning giving 0.4W as SWR to the unskilled labour component. The unskilled labour component of the maintenance part is also worked out in the same manner. These estimated economic costs of the project are shown in terms of economic cash-flow in Table 9.8. Like in other industrial projects, here also we have given a weight of 30% to the material component in the economic analysis.

As far as outputs are concerned, the market price of timber used for paper and pulp production(Rs.225/ per quintal) is observed to be 1.25 times higher than the auction rate(Rs.180/ per quintal). Hence the economic price of timber is taken as 1.25 times more of the financial rate/auction rate. With these adjustments the net economic benefit stream is estimated which are shown in Table 9.8. It is seen that the net economic benefit has been Rs.81,59,000/ while the financial net benefit is Rs.34,69,000; it implies the economic net benefit is 2.35 times more than the financial value.

Adhering to the earlier procedures we have estimated various evaluation criteria from net the economic benefit streams with 11% economic rate of discount. The estimated results are shown below.

Table 9.10: The NPV, BCR and IRR Estimates of Plantation Project by BILT (in terms of Economic consideration)

Criteria	EDR 11%
NPV	Rs.26,70,000/
BCR	2.35
IRR	28%

The above economic estimates of NPV, BCR and IRR reveal that the plantation by the BILT is very much feasible economically as the NPV is quite high. BCR is also more than one and IRR is also more than market rate of interest.

In the next step, we have added the fuel benefits to the net economic benefit stream. Generally for paper and pulp longer poles are preferred and longer poles will be available only if there is proper thinning. It is reported that the residuals after thinning being used for fuel. To estimate those benefits we have followed the same procedure as has been followed for all projects. Accordingly, we have estimated that the fuel benefit from this plantation project would be Rs.10,800/ in the fourth year onwards which increases to Rs.16,200/ in the 5th year later increases to Rs.21,600/ from 6th year onwards. Thereby the total fuel benefits are estimated as Rs.91,800/ which are added to the net benefit flow. The details are given in Table 9.11.

Again the last and important factor to be included is the environmental benefits. For their estimation we have followed the same procedure as for other projects, i.e. with unit environmental benefit of Rs.56,880/ per hectare per annum. Since in this plantation project also the survival rate of the plants are nearly 85%, we have estimated the amount accordingly and the corresponding figure for the project over 60 hectares is estimated as Rs.29,00,000/ per annum. When this value has been included into the net socio-economic benefit stream(shown in Table 9.11), the net social benefit becomes Rs.2,27,50,000/.

Table 9.11: Socio-Eco-Environmental Estimates of the BILT Plantation Project

(Figures in thousand rupees)

Cost/Benefits	1990-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	Total
A.Costs	2350								
1.Land	(822.5)								
2.Establis ment Cost	116 (116)								
3.Insu-rance	300 (0)								
4.Labour	300 (120)	556 (222.4)	200 (80)	100 (40)	--	--	--	--	**1156 (462.4)**
5.Material	100 (115)	350 (402.5)	100 (115)	--	--	--	--	--	**550 (632.5)**
6.Mainten ance (Material)	-	--	--	80 (92)	80 (92)	120 (138)	120 (138)	120 (138)	**520 (598)**
Maintenan ce(Skilled Labour)	--	--	--	24 (24)	24 (24)	36 (36)	36 (36)	36 (36)	**156 (156)**
Maintenan ce(Unskill ed Labour)	--	--	--	96 (38.4)	96 (38.4)	144 (57.6)	144 (57.6)	144 (57.6)	**624 (249.6)**
TC(MP)	3166 (1173.5)	906 (624.9)	300 (195)	300 (194.4)	200 (154.4)	300 (213.6)	300 (213.6)	300 (213.6)	**5772 (3037)**
TC(90-91 prices)	3166 (1173.5)	796.37 (549.28)	239.4 (155.6)	221.1 (143.27)	133 (102.67)	181.5 (140.1)	172.8 (133.4)	172.8 (133.4)	**5082.9 (2531.2)**
B.Benefit									
1.Timber	--	--	--	--	--	--	--	15750	**15750**
Total(MP)	--	--	--	--	--	--	--	15750	**15750**
Total(90-91)	--	--	--	--	--	--	--	8552 (10690)	**8552 (16690)**
Indirect Benefits(90-91)	--	--	--	10.8	16.2	21.6	21.6	21.6	**91.8**
Environmental Benefit	--	--	--	2900	2900	2900	2900	2900	**14500**
C.Net Benefit	-3166 (-1173.5)	-796.3 (-549.2)	-239.4 (-155.6)	-221.1 (-143.2)	-133 (-102.6)	-181.5 (-140.1)	-172.8 (-133.4)	8379 (10556)	**3469 (8159)**
D.SE Net Benefit	-1173.5	-549.2	-155.6	-132.4	-86.4	-118.5	-111.8	10577.6	**8250.8**
E. S-E-E Net Benefits	-1173.5	-549.2	-155.6	2767.6	2813.6	2781.5	2788.2	13477.6	**22750.8**

Note: The figures in the parenthesis indicate the economic or shadow price of the estimate.

The last step in the analysis is to account for the inter temporal time preference, with 2% SDR the net socio-economic benefit flows are discounted and the corresponding NPV, BCR and IRR are estimated, which are shown in the following table.

Table 9.12: The NPV, BCR and IRR Estimates of the BILT Plantation Project (in terms of Socio-eco-environmental consideration)

(NPV in thousand rupees)

	Stage	NPV	BCR	IRR
I.	Socio-Economic Estimates	6820	3.83	28%
II.	Socio-Eco-Environmental Estimates	19701	9.19	70%

The results show that the NPV at 2% SDR is quite high in both the cases and establishing thereby the viability of the project. The BCR is also more than one in all the situations and IRR is higher than market rate of interest. Both the NPV and BCR increased by 3 times at least. Thus, the project is quite profitable from the point of view of the society.

9.9 Concluding Observation

Since the plantation project by the NALCO was for environmental improvement, the project has not exhibited its viability from financial and economic point of view. But when environmental benefits are introduced into the analysis, the results improved significantly and the project proved to be viable.

On the other hand, the plantation by the BILT has been showing high net economic and social present value. The NPV and BCR are also high at 2% SDR. Thus the plantation by the BILT is quite efficient in terms of commercial, economic, and socio-eco-environmental analysis.

Chapter 10

CONCLUSIONS AND POLICY IMPLICATIONS OF THE STUDY

10.0 Introduction

The SBCA results in terms of financial, economic and socio-economic analysis of eight typically plantation projects of Orissa belonging to four varieties are already presented in the last four chapters. The discounted NPV and BCR as well as the IRR estimates of those projects are also contained in those chapters. However, no comparative analysis of those results are carried out by us. In this concluding chapter, we propose to undertake such a comparative analysis and to draw some policy implications for the planners and policy-makers on the basis of our findings from the empirical investigations. In addition to these, we have identified some common and general weaknesses of the study and thereby suggested scope for further research.

10.1 A Recapitulation

This study is a modest attempt to understand the role of forests in the development of an economy, particularly, for a developing economy like India. We have discussed in detail the contribution of forest sector in the economic development as well as environmental conservation. Though environmental protection and economic development are compatible on a theoretical plain, in practice, a trade-off exists between them. This is more so in the context of developing countries which are presently striving to achieve high growth rates in order to attain the standards of living of the industrialised countries. The developing countries face environmental problems at two levels-first, the impact of high growth oriented development on environment; and second, the direct impact of the improved standards of living on environment through different life styles. The development activities, such as construction of large irrigation projects, adoption of modern, input intensive, technologies for agricultural growth, rapid industrialisation etc.

belongs to the first category. The second category involves affluent life styles which draw heavily on the natural resources and also entails pressure on environment. In this scenario the best way to combat environmental degradation is the adoption of environment friendly technology fostered through proper policies.

The Government of India, under the various Five-year Plans, keeps on emphasising on promotion and protection of its natural environment. From time to time various plans, policies and programmes are adopted towards preservation of environment. The details of such policies and programmes are already discussed in chapter 3. However, there are a number of problems associated at the implementation level. Of course, with wide variations among States, some States are, in fact, doing well in tackling the problems of environmental degradation. For instance, Maharashtra and Karnataka, and now Rajasthan, are doing well with regard to water shed management, while West Bengal's Joint Forest Management(JFM) is highly acclaimed. Since 1993 Orissa has also pioneered in JFM programmes.

In order to solve the problems of forest development, proper policies should be implemented and this proper policy can be undertaken only after projectisation of forest development programmes. Since both land and investible funds are scarce, financially and economically viable projects should only be taken up. However, in view of presence of imperfections in markets and also due to policy failures, it is expected that ordinary financial market signals fail to secure economically efficient solutions. Thus, it is argued that to improve rational decision making process with respect to forestry resources, it is necessary to collect information so as to adequately incorporate environmental externalities as well as to eliminate the market distortions. In order to accomplish this task, Social Benefit-Cost Analysis(SBCA) can be used as a proper framework. The literature on forestry management also portrays the need of SBCA in the forestry sector for establishing their viabilities. In view of these arguments our modest attempt in this study has been to evaluate few plantation schemes from a selected region, i.e. Orissa. We have selected Orissa as the study area owing to its agrarian characters where forests have a great role

for its all-round development. As per Government statistics forest area in Orissa constitutes more than 35% of the geographical area which is much ahead of the all-India average. Moreover, there is a good scope of forest development through its proper management. Furthermore, the tribal of Orissa are very much dependent on forests for their livelihood. But with disappearance of forests owing to large scale industrialisation, agricultural expansion, irrigation development, and other infrastructure development, the tribals as well as the rural poor are facing a lot of hardships.

With a view to overcome those problems and to compensate deforestation, the Government of Orissa had has been involved in plantation programmes through its different departments; the leading organisations/institutions being the Forest Department, Soil Conservation Department and the Agriculture Department. Of late, the industries have started participating in afforestation activities; particularly, with the execution of the Forest Policy of 1988, in which it was mentioned clearly that industries using forest products as inputs must produce resources on their own or they were advised to use substitutes of those forest products. On the other hand, other large industries which are established over vast tract of forest land, are also advised to undertake the Compensatory Afforestation Schemes under which they should afforest that much land they have deforested for their establishment.

Moreover, private organisations now-a-days have come forward for plantation activities. Influenced by the environmental awareness in the World, voluntary organisations are very much keen in increasing the social awareness and they are engaged in the process of motivating the general people for plantations.

However, with so much attention being given to increase the plantation, the result is not satisfactory; still rate of deforestation in Orissa is higher than the rate of afforestation. That implies the rate of afforestation done by all agents is not enough, hence Government wants to increase it. Simultaneously, with the increase in population and consequent urbanisation, availability of land is becoming scarce day by day; hence the

Government is facing problems in allocation of land to various organisation for plantations. On the other hand, the Revenue Department is not ready to lease land to all interested parties as they feel that the land is not properly utilised by those organisations. In the name of increasing plantations, organisations ask for land; but after acquiring the land they use it for other purposes. Therefore, it is felt that land should be given to those agents whose plantation efficiency is very high. With a view to get a suitable answer to such questions, our study is attempted to evaluate eight sample plantation schemes of four different agents. Those plantation projects are selected with the help of multi-stage sample.

As regards the selection of sample projects, we selected the State of Orissa at the first stage. In the second stage, an examination of the State level data revealed that Puri district would be the ideal district for our study, as it contains the representative agencies needed for our analysis. Our sample projects are drawn at the third stage from the territorial division and social forestry division of Forest Department, and from Cashew Development Corporation on behalf of Soil Conservation Department. But the sample plantation projects of the industrial group, viz., the NALCO, and the BILT are purposively chosen from the neighbouring districts of Dhenkanal and Cuttack. From each group two projects are selected depending upon availability of data, success of the projects and other factors like convenience etc. Accordingly, we have covered eight different projects and those are: the Gopalpur SFP and the Mundal SFP from social forestry division; Balukhanda C-11 and C-13 from territorial division; Ranpur and Kadamjhola 3 from cashew corporation; and the plantation by the NALCO and the Ballarpur Industries Limited from industry. While the GopalpurSFP, Mundal SFP and the NALCO plantations are subjected to ex-post evaluation, for the other five projects we have undertaken ex-ante evaluation.

As we have already discussed above that the SBCA is the proper tool for establishing social viability, we have adopted the UNIDO approach of SBCA among four approaches(viz., the OECD Manual, UNIDO approach, the World Bank Method and the

Effects method) as it is considered as a better approach for a developing country like India. However, few modifications have been introduced in order to apply this tool to forestry sectors in terms of use of 2% social rate of discount and in terms of quantification of indirect benefits/externalities. Therefore, our analysis has involved three steps-financial analysis, economic analysis and socio-economic analysis.

10.2 Methodology Adopted in Brief

As a first step of the SBCA the financial analysis has been carried out under the UNIDO Guidelines framework whereby the net benefits of the projects are estimated at market prices. In order to ascertain comparability of all projects, we have adjusted the prices to 1990-91 level with the wholesale price indices. Thus, our financial analysis has been undertaken at constant market prices of 1990-91. In order to account for the inter-temporal time preferences, we have discounted the net benefit stream with different rates of discount. Though the standard discount rate of public sector investments is 10-12%, but it has been advocated by different economists that the forestry projects should be discounted with low rates of interest, in the order of 2-3%. Accordingly, we have discounted the net benefit stream with 2% to 12%. With the discounted flow of the streams of costs and benefits the investment criteria like NPV, BCR and IRR are estimated to examine the viabilities of the projects.

Recognising the fact that there are imperfections in the market prices of inputs and outputs, in the next step, in order to avoid the distortions we have introduced the shadow prices of the inputs and outputs like labour, land, fertiliser and timber. With the help of the shadow prices and weights the economic analysis has been undertaken in terms of the evaluation criteria like NPV, BCR and IRR with the EDR of 11%.

In the next step we have included the externalities, i.e. the benefits which are not priced. In the first case we have estimated the fuel and fodder benefits of the plantation projects which are estimated following contingent valuation method. In the second case we have estimated the environmental benefits of the projects, the procedure being based

on Rath(1997) study. With proper modifications we have included the externalities in the SBCA and the net socio-economic-environmental benefits are arrived at. With 2% social discount rate(advocated by several economists) the net benefits stream is discounted and from the discounted net benefit stream the decision criteria are estimated.

In tune with the decision criteria from each step of the SBCA the projects are compared. Furthermore, while comparing the viabilities of the projects, in addition to these three criteria we introduced another criterion based on NPV i.e. NPV per hectare because it is a better index for intra-project comparisons.

10.3 Major Findings of the Study

Since the SBCA has been completed in three steps in our study, we will present the major findings from each step as follows.

Step 1: Results of Our Financial Analysis

(1) Taking NPV as the decision making criterion, our study has established that the plantations of the Ballarpur Industries Limited has the highest NPV at 2% rate of discount. The second in the order is the Balukhanda territorial plantations, followed by the Gopalpur social forestry project, which are shown in Table 10.1. Even at 5% rate of discount the ordering remains the same i.e. while Ballarpur Industries has maximum NPV(Rs.11,83,000/), territorial plantations(i.e. Balukhanda C-11) is the second one with Rs.5,05,000/ NPV and the third in the line is Gopalpur SFP with Rs.3,23,000/ NPV. However, when the rate of discount increases to 10%, the highest NPV is attained by the territorial plantations(Balukhanda C-11 with Rs.3,06,000/) followed by Gopalpur SFP(Rs.1,31,000/). At 12% discount rate also the ordering is same as that of 10%. The results further reveal that the projects of the Cashew Development Corporation and that of the NALCO are not financially viable.

Table 10.1 Financial Estimates at 2% Rate of Discount

Categories/Project Name	NPV	BCR	IRR
I.Social Forestry Projects			
Gopalpur SFP	617000	7.28	30%
Mundal SFP	18600	1.41	6%
II.Block Plantations of Territorial Division			
Balukhanda C-11	685000	17.3	45%
BalukhandaC-13	514000	17.2	45%
III.Cashew Projects			
Ranpur	-932000	0.84	0%
Kadamjhola 3	-218000	0.87	1%
IV.Industrial Plantations			
NALCO	-87300	0.24	--
BILT	2420000	1.49	9%

Note: The NPV in rupees, BCR in number, and IRR in percentages.

(2) But when the BCR is taken as the decision criterion, the territorial plantations have highest BCR at all rates of discount followed by Gopalpur SFP and plantations by Ballarpur Industries Limited. At 5% rate of discount the BCR of Balukhanda C-11 and Gopalpur are 13.7, and 5.77; at 10% it is 9.5 and 3.95 and at 12% it is 8.24 and 3.41 respectively. The ratios with 2% rate of discount are shown in Table 10.1, which also establishes the same ordering.

(3) Taking IRR as criterion the territorial plantations also have highest IRR followed by Gopalpur project. While the IRR of Balukhanda C-11 and C-13 are same i.e. 45%, the IRR of Gopalpur project is 30%. Contrary of our findings in terms of NPV and BCR, the BILT project is not viable in terms of financial terms if IRR is taken as the decision criteria. The IRR is only 9% which is much less than the market rate of interest. Our economic analysis has maintained the same trend as in the financial criteria.

Step 2: Results of Our Economic Analysis

(1) With NPV as a criterion, the Ballarpur Industries Limited has highest NPV at 11% EDR, followed by territorial plantations and Gopalpur SFP respectively. At 11% EDR the NPV of the BILT project is Rs.26,70,000/; that of Balukhanda C-11 and C-13 are

Rs.3,57,000/ and Rs.2,68,000/ respectively while that of Gopalpur is Rs.1,62,000/. Just like the financial analysis results, here also the Cashew Development Corporation projects as well as the NALCO project do not cross the test of economic viability as their NPVs at 11% are negative.

Table 10.2 Economic Estimates at 11% Rate of Discount

Categories/Project Name	NPV	BCR	IRR
I.Social Forestry Projects			
Gopalpur SFP	162000	7.81	43%
Mundal SFP	11000	1.52	17%
II.Block Plantations of Territorial Division			
Balukhanda C-11	357000	15.8	56%
BalukhandaC-13	268000	15.7	56%
III.Cashew Projects			
Ranpur	-363000	0.86	9%
Kadamjhola 3	-102000	0.84	9%
IV.Industrial Plantations			
NALCO	-41800	0.27	--
BILT	2670000	2.35	28%

Note: The NPV in rupees, BCR in number, and IRR in percentages.

(2) But with BCR as a criterion, the results show that territorial plantations having maximum BCR at 11% EDR followed by Gopalpur SFP. At 11% EDR Balukhanda C-11 has BCR of 15.8 and that of Gopalpur is 7.81.

(3) Similarly, the IRR as a criterion indicates that territorial plantations having highest IRR(56%) followed by the Gopalpur SFP(43%), the Ballarpur Industries Limited(28%) and the Mundal SFP(17%). The IRRs for other projects are less than 10% or indeterminate.

Stage II

(1) With introduction of the environmental/ecological benefits into our analysis, the viability rank orders of the projects have changed drastically. In terms of the NPV, the cashew development projects which were not feasible, attain the highest rank. They occupy the first and second rank, followed by the BILT and the Gopalpur SFP. The details are given in Table 10.4. However, wheen BCR is taken as the decision making criterion, the highest rank is accorded to the block plantations of the territorial division, followed by the social forestry projects. But when we examined the IRR results, we found that the SFPs are the most viable projects. In contrast, the BILT project, which had attained the highest rank in our earlier analysis, moves to the lowest rank. All those details are indicated in the Table 10.4.

Table 10.4 Socio-Eco-Environmental Estimates at 2% Rate of Discount

Categories/Project Name	NPV	BCR	IRR
I.Social Forestry Projects			
Gopalpur SFP	5336000(4)	95.13(3)	242%(1)
Mundal SFP	2009000(7)	78.09(4)	242%(1)
II.Block Plantations of Territorial Division			
Balukhanda C-11	2821000(5)	99.51(1)	233%(2)
BalukhandaC-13	2110000(6)	98.67(2)	230%(3)
III.Cashew Projects			
Ranpur	252728000(1)	69.94(5)	123%(4)
Kadamjhola 3	6136000(2)	64.08(6)	123%(4)
IV.Industrial Plantations			
NALCO	2003000(8)	25.83(7)	198%(5)
BILT	19701000(3)	9.19(8)	70%(6)

Notes: (i) The NPV in rupees, BCR in number, and IRR in percentages.
(ii) The figures in the parenthesis show the rank order.

However, as we have already mentioned that all these projects have wide variations in their area of plantations (for example, while the Ranpur cashew project has 255 hectares, the Gopalpur project is covering only 5 hectares). Moreover, there are wide gaps in terms of the magnitude of the investment in each project. In view of these differences, we arrived at the conclusion that the conventional investment criteria of NPV, BCR and IRR would not be sufficient for any meaningful comparison of these projects. To overcome, these comparability problems and in order to arrive at a commensurable base, we have proposed that the NPV per

hectare should be an ideal criterion. Accordingly, we have recalculated the per hectare NPV of all the projects with 2% SRD, which are presented in Table 10.5.

Table 10.5: Estimates of NPV per hectare at 2% Rate of Discount

Category/Project Name	Financial	Economic	S-E	S-E-E
Gopalpur SFP)	123400(1)	163200(1)	171000(1)	1067200(1)
Mundal(SFP)	2650(4)	7380(6)	9950(6)	287000(7)
Balukhanda C11(Territorial)	85600(2)	107370(3)	109800(3)	352600(4)
Balukhanda C13(Territorial)	85600(2)	107330(3)	109600(3)	351600(5)
Ranpur(Cashew)	-3650(6)	16550(2)	16730(5)	991090(3)
Kadamjhola(Cashew)	-3510(5)	19800(4)	20000(4)	994120(2)
NALCO(Industry)	-10900(7)	-5850(7)	-540(7)	32300(8)
BILT(Industry)	40300(3)	111980(2)	113660(2)	328350(6)

Note: (i) The figures of NPV in rupees.
(ii) The figures in the parenthesis indicate the rank orders.

An analysis of the results of the above table reveals that the rank order of the projects vary with our movement from one stage to another stage analysis, i.e. from financial to economic, next movement from economic to socio-economic and finally from socio-economic to socio-economic-environment analysis. However, the Gopalpur SFP has all along maintained its first rank in all stages. It is followed by the block plantation of the territorial division in the second and the place except in the socio-economic-environment stage. On the other hand, the plantation of the BILT, though occupies the second and third position in the economic and socio-economic as well as the financial analysis, moves to the sixth place in the socio-economic-environment analysis.

From the above findings it is observed that the social forestry plantations of the territorial division are showing higher NPVs per hectare. The main reasons behind their higher rank are that these are small life-span projects and also their per hectare cost of plantations are very less compared to the benefits. These plantations also involve least maintenance cost whereas other projects with longer life-span have to bear high maintenance costs as well as their total investment cost are also high. In addition to these, some of the benefits are not properly harnessed from those projects.

Another interesting finding is that though the cashew projects are showing negative NPVs at low discount rates even, in terms of IRR their rank order improves to second and third places.

Moreover, these projects having less life-span involve high operation and maintenance cost in the form of watch and ward. To add to it, the realised benefits are less as cashew-nuts are auctioned at less prices than the market prices due to various socio-economic and political reasons. The plantation project by the NALCO which had been undertaken for environmental improvement purposes shows least efficiencies. This project indicates NPV in all scales other than the socio-economic-environmental scale. But its relative position remains at the lowest level among our sample projects.

10.4 Policy Implications of the Study

On the basis of the above findings, we have drawn the following policy implications.

(i) For the forestry development projects, the social benefit cost analysis is the appropriate tool, which is capable of reflecting the various planned goals as well as the environmental factors.

(ii) In order to establish the viability of forestry projects, the financial analysis is not adequate for decision making, not even the economic analysis. The socio-economic aspects coupled with the environmental/ecological aspects should be taken into account in examining the viability of those projects.

Our study confirms to the findings of Saxena & Agarwal(1997) who have observed that adoption of socio-eco-environmental accounting would help in improving the overall performances of forestry projects because our study establishes that the Gopalpur social forestry project is the most socially viable project.

Our study further corroborates the findings of other studies like R A Sharma, DPS Verma who have advocated that the socio-economic aspects of forestry sector depicts their true values.

(iii) Since our findings establish that externalities are important components of SBCA, the policy makers should not neglect those aspect in examining the viability of the forestry project. In this regard our study also confirms the hypothesis of Rath(1997) who has argued that since the external benefits of social forestry projects are more prominent than the direct benefits, those benefits should not be neglected in establishing the economic viability of such projects.

(iv) Our study also satisfies to the hypothesis of Blair(1986). According to him the objectives of the social forestry projects should be modified according to the local people's needs. To this findings we would like to supplement that the social forestry projects should be of mixed variety. This implies that instead of mono cropping patterns in plantations, the policy makers should aim

at mixed plantations for higher socio-economic benefits. Moreover, our literature survey also shows that Patel(1987) has called for mixed cropping in social forestry in order to achieve better results. Since our sample project of Gopalpur SFP has mixed varieties of plants(i.e. casuarina, eucalyptus, and cashew), its profitability is significantly higher than the other social forestry projects. Harrison and Sharma(1995) had also found out that 78% of people in Australia planted at least four species, compared only 5% adopting mono culture plantings. Some land holders had planted 40 or more species, mostly natives and many of recognised high timber quality. Thus policy makers should bear in mind that while planning the social forestry projects, they should go for multiple variety of plants.

(v) From our field observations another point that has emerged is that for success of plantation projects, the participation of local people is very much needed. The general remark of the people engaged in social forestry programmes was that the social forestry plantation is their own unlike the government plantations. On the other hand, the local people near the cashew project sites are very unhappy as they are not getting any kind of material benefit from the project. The process of harvesting of cashew nut involves open auctions. Because of profit motive, the auctioneers prefer to employ their own workers. So, no financial benefit is being received by local people. Moreover, even if local people want to protect the area and reap the benefit of cashew projects, due to political and bureaucratic hurdles, they do not succeed in getting the auctions. Hence, they are dead against the cashew projects in their surroundings. In this respect, our findings support the views of Prof. Harrison[1], who states: "Often the forests which best meet a variety of objectives are those arising from 'bottom-up' design, that is, involving local community inputs".

(vi) On the other hand, the local people associated with SFPs are very much enthusiastic about their plantations. Both the sample projects fulfil the local needs of fuel, fodder and small timber. The villagers are united the projects. However, as reported earlier that SFPs are relatively successful where there are homogeneity in castes of the local people. With different classes and castes it is difficult to manage the plantations peacefully. This has been proved from our field experiences too. The Mundal SFP which was established in 1985-86 resulted in division of two hamlets where two different castes are residing. After the maturity harvest the lower caste people

[1] Harrison,S.R.(1997), "Recreation and Amenity Values of Reforestation", Paper presented in the 4th International seminar on Tourism and Economic Development held at Bhubaneswar, Orissa.

are not satisfied with the way the distribution of benefits took place. Hence, they have started another plantation project for which they are very much enthusiastic. Though the SFP creates bad relationship, at the same time, it has helped in development of villagers with competitive feeling among the two hamlets.

10.5 Significance and Scope for Further Research

The significance of the present study lies in the attempt to compare different plantation schemes which is not yet undertaken by any body in India. Further no study had covered a comprehensive SBCA based on variety of estimates. Though Ansi Niskanen(1997) had studied the financial and economic profitability of afforestation in Thailand and the Philippines, the socio-economic part was neglected. For a developing country like India, socio-economic as well as environmental aspects are more vital for decision-makers and policy planners.

The SBCA can be further improved by actually estimating the shadow wage rates by collecting data from the unskilled workers who are employed in the plantation projects. Due to non-availability of such data and time limitation, we could not undertake this part of the analysis, and have approximated the SWR as calculated by other researchers in their earlier studies. Similarly, the results can further improve with actual estimation of the shadow price of material inputs.

Since our study reveals social forestry projects with mixed plantations and industrial projects to harness raw materials are more appropriate for the society, one can concentrate more on those two groups of projects and such analysis would show which is the better one.

In spite of our best of efforts to improve our analysis, we feel that there are some vital issues like estimations of ecological and environmental benefits etc. which still need further investigation. Thus there is a good scope for further research in the forestry sector. As far as the estimation of environmental benefits are concerned, persons with scientific knowledge and field experiences can do better justice to the analysis which will add further flavour to the study. Indeed, such exercise calls for an integrative multi-disciplinary approach in which the soil scientists, forestry experts, economists, administrators, and NGOs can join hands in estimating the time value of environmental/ecological benefits.

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